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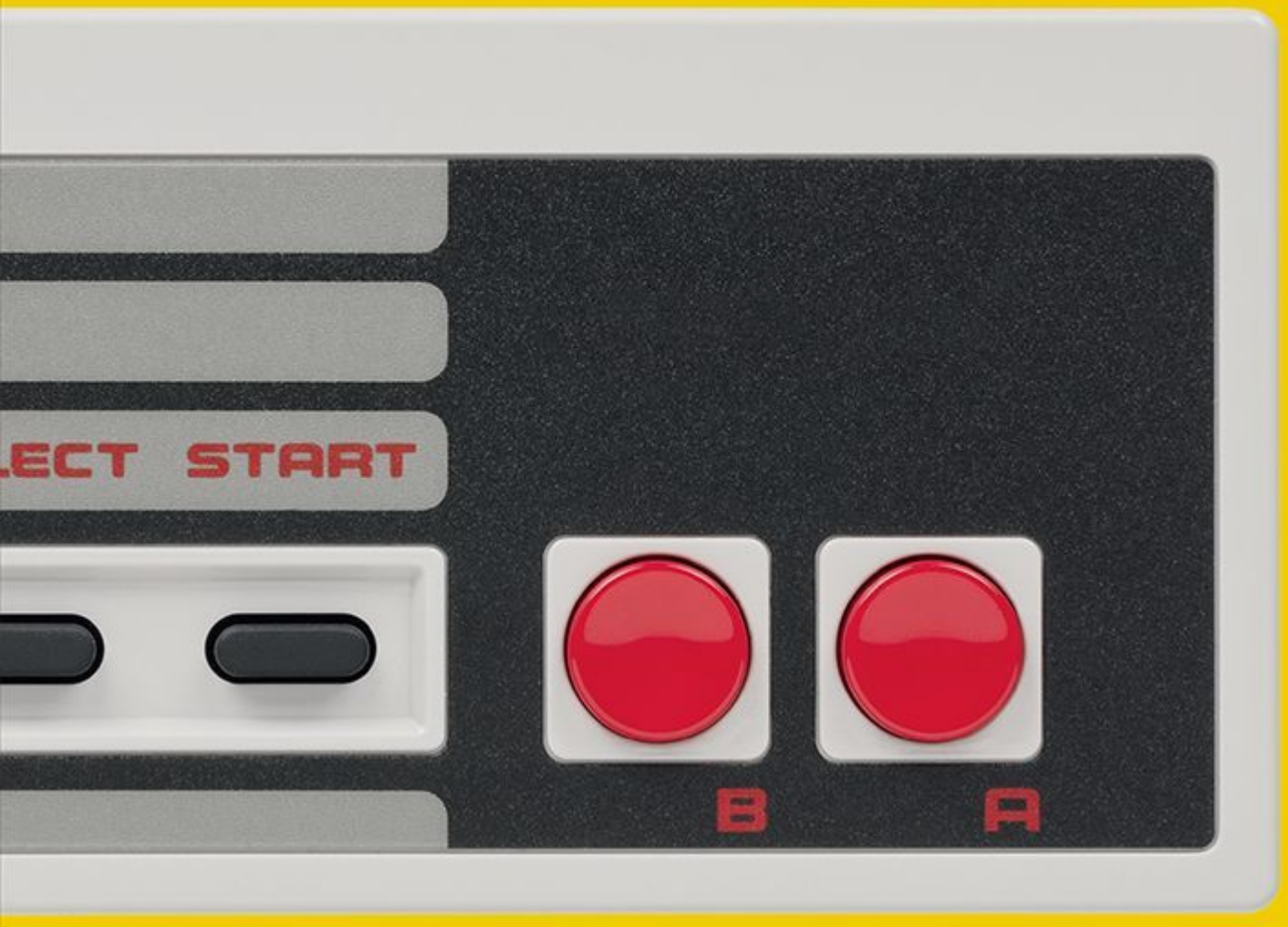

THE GAME CONSOLE 2.0

A Photographic History from Atari to Xbox

Evan Amos

no starch press

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Evan Amos

San Francisco

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To Aaron

Wii U
Sega Saturn Accessories
Dreamcast
Game Boy Advance
Nintendo 3DS
Game Boy Pocket, Color + Game + Watch
Modern Accessories
Sega Genesis
Atari Lynx
Random Handhelds
PlayStation 2
PS3 + Vita
Nintendo GameCube
FAMILY COMPUTER
SEGA MARK III
FAMILY COMPUTER
Nintendo
SUPER Famicom
SG-1000
PS2
INTERACTIVE VISION
SONY
PlayStati
COMPUTER VIDEO GAME SYSTEM...BY MAGNAVOX
CHANNEL F SYSTEM II
SHARP
NUON
SONY
PS4
vtech
V.SMILE
V.FLASH
VIDEO COMPUTE
SOCRATES
ODYSSEY

SEGA
SUPER Acan
VIRTUAL BOY
PSP
XBOX ONE
Action Max.
First Real Action
Game System.
COMMODORE 64
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Introduction

I was born during the great gaming crash. By the time I was old enough to play video games, the American market had revitalized itself and entered into a new era thanks to Japanese consoles such as the NES. The NES, that unassuming gray-and-black box that we hooked up to a ratty 13" TV, was my real introduction into video games. It grabbed a hold of me hard, and I spent a lot of my childhood playing, reading about, or talking about games. That enjoyment of video games has followed me my whole life, from the PlayStation to the Xbox 360 and beyond. Video games stirred a fascination and appreciation within me that eventually led to the creation of one of the most important archives of gaming history.

My work in video game preservation began on a whim, almost by accident. It started years ago on Wikipedia, the online encyclopedia that anyone can edit, where I read through articles of old and obscure game consoles. If you spend time on Wikipedia, you might notice one of the site's biggest failings: its photos. Due to its rule that photos need to be copyright free, and the fact that many Wikipedia editors are writers and not photographers, the pictures in articles tend to be poorly taken or nonexistent. Reading through those old console articles made me want to contribute, even though it meant giving away all rights to upload a photo. I had the camera equipment and some of the consoles on hand, and soon I was taking photos of gaming hardware for Wikipedia articles.

I became obsessed with the project. I took hundreds of photos and filled article after article with pictures. After a while, I noticed my photos had spread far beyond Wikipedia. They appeared in books, magazines, news reports, YouTube videos, and even museum exhibits. The photos had filled a void I wasn't aware existed. Now various fans, creators, and professionals had easy access to consistent, quality photos they could use for their teaching, reporting, and art. The impact led me to expand my work, and I set up a Kickstarter to purchase consoles to photograph. The fundraising campaign was successful, and the exposure led to a book deal. This book is the result.

My goal for this book is to present the history of video games through the evolution of console hardware: from the popular market leaders, to the also-rans, to the outright failures. I have spent years seeking out and photographing as many consoles and gaming computers as I could get my hands on. Most consoles are accounted for, even super rare systems such as the RDI Halcyon. This revised and updated second edition fills in some gaps from the first edition and includes new ninth gen systems. This second edition also features many updates and improvements: consoles are now listed chronologically, the spec boxes are more consistent, some photos have been retaken, some entries have been rewritten, and the end of the book has been fleshed out with new content.

I hope you enjoy this book and learn or see something new, whether you're a seasoned retro enthusiast or a new gamer discovering the long, rich history of game consoles.

Atari 800 motherboard (right)

J110
J111
J112

Author Notes

Photos and construction All layout, photography, and photo editing was done by me. This book was put together with Adobe InDesign CS5, Adobe Photoshop CS5, and a Wacom Intuos3. Most photos were shot with either a Nikon D7000 or D7100 DLSR, using 60mm or 105mm Micro Nikkor lenses. Other cameras used include the Nikon D7500, Nikon D810, and Sony A700. Photos were taken with Paul C. Buff strobe lights, using two Einsteins and one White Lightning X800.

Research Book research was conducted mainly through official documents, books, catalogs, newspapers, press releases, and gaming magazines. Archives on dedicated fan websites were invaluable for older and obscure systems. Information taken from interviews of people involved with console and game development was taken in good faith as being accurate and true.

PC gaming Ideally, the IBM PC should be in this book. The issue is that an on-going computer platform that started in the 1980s doesn't fit well into a book sorted into generations. Sourcing old, era-accurate hardware was also an issue, so it was cut.

Colors spec The Colors spec is simplified and lists only the total color palette. Many early consoles had large color palettes, but were limited to a certain amount of colors on screen, on a line, or per sprite at a time.

Games released This spec is a headache to verify to an exact number since the definition of "game" and "released" can be debatable. It is also difficult to prove all listed games existed for old and obscure consoles. For modern consoles with digital stores, their totals can be greatly inflated with indie games and retro rereleases.

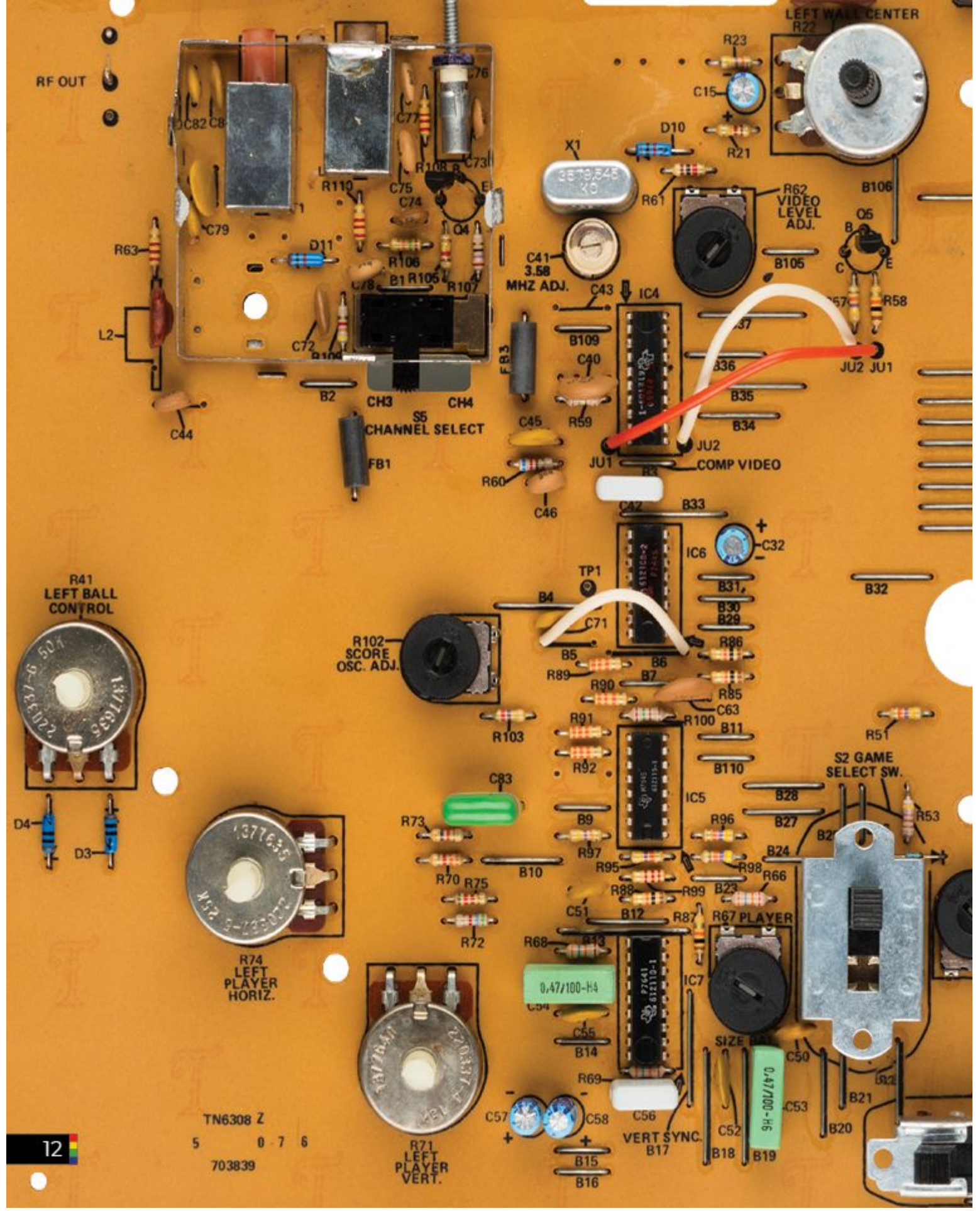
Console sales Never trust sales figures, as a lot of sales data doesn't come from official or reliable sources. Many numbers seen online and in print can't be verified, especially for older and obscure consoles. Worse, even official sales numbers have been known to be exaggerations, counting systems shipped to stores, not sold. In the first edition I excluded a lot of numbers for these reasons, though in this edition I have included commonly accepted numbers to make the spec bars consistent. Note that many numbers are estimates and will likely never be confirmed.

Acknowledgments

This book wouldn't have been possible without the help of many people, most of whom donated money for purchasing consoles to be historically preserved. Their names line the book's outer pages, along with those who have contributed to this book in other ways, including my friends and family.

I'd also like to thank all of the historians and enthusiasts who compiled, archived, and scanned information that gave insight into these console's histories and made this book's research possible. Finally, thanks to the retro collectors who sought out and saved rare items, whose efforts are now preserved for future generations to see.

Wii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R68
R13
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C54
C55
B14
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C50
R69
C56
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C57
C58
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C53
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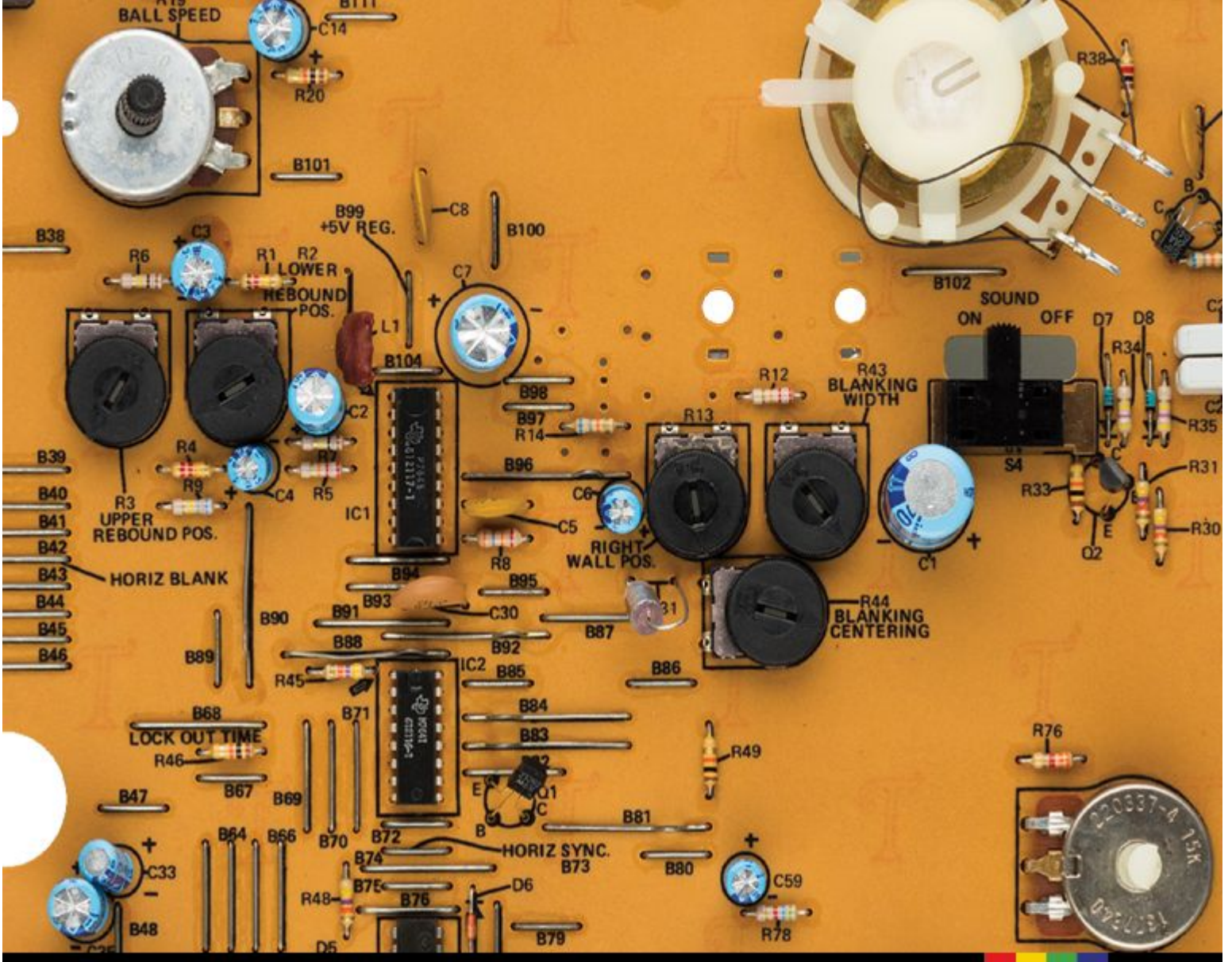


First Generation

Long before *Pong*, the idea of using an electronic display to provide interactive entertainment could be seen in research laboratories and universities across the United States. One of the earliest examples comes from 1958, when a researcher at Brookhaven Laboratories repurposed one of its analog computers and built handheld controllers to simulate a tennis match. Later, other early games such as *Spacewar!* (1962) appeared at the Massachusetts Institute of Technology, which required the use of a large and expensive computer. Video games didn't hit the mainstream until 1972 with the release of the Magnavox Odyssey and the arcade hit *Pong*. This new form of entertainment fascinated young people and began a craze that would become a multibillion-dollar worldwide industry.

Magnavox Odyssey 500 series motherboard (above)

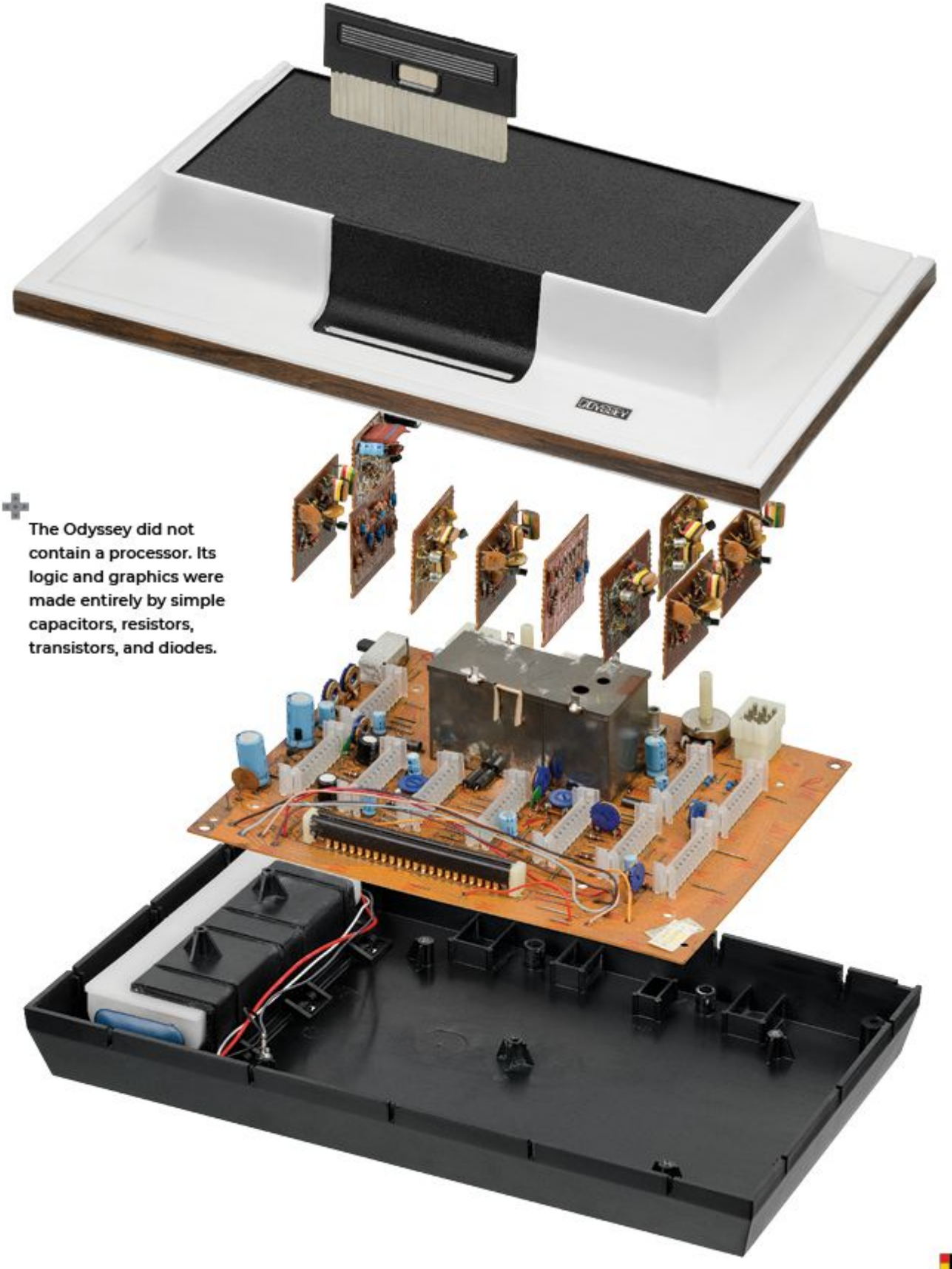
Magnavox Odyssey

1972

Launch price: $99	**Systems sold:** 330,000+
Processor: None	**RAM:** None
Colors: 2 (black and white)	**Games released:** 28 game variants on 11 cards

The Magnavox Odyssey was the world's first consumer device that let people play interactive games on their television. Limited by the era's primitive technology, the Odyssey's games utilized white squares and lines that players could move around on a black background. The console's standout game was a simple two-player version of tennis, which was the direct inspiration for *Pong*. While it would be *Pong*, not the Odyssey, that launched the video game craze, Magnavox's system was an amazing achievement for its time and set the stage for the modern age of video games and consoles.

Planning and design for the Odyssey began as far back as 1966.



The Odyssey did not contain a processor. Its logic and graphics were made entirely by simple capacitors, resistors, transistors, and diodes.

Brown Box Prototype and Light Gun

The Magnavox Odyssey originated in the 1960s at the defense contractor Sanders Associates, where engineer Ralph Baer worked on the idea of a device that hooked into a television to play games. By 1967, Baer had developed the TV Game Unit #7, a metal box covered in switches and woodgrain vinyl with two controllers. Later nicknamed "The Brown Box," this prototype could change between game types by flipping its numerous switches, which included a shooting game that was played with a modified toy rifle. The Brown Box was later shown to Magnavox, who licensed and developed it into the Odyssey game console.

After his retirement, Ralph Baer hand-built a few Brown Box replicas, like the one photographed here. The original Brown Box resides in the Smithsonian.

The first console accessory sold was a light gun. Many *Pong*-era systems included light guns for target and shooting gallery games.

Color overlays came in two sizes, 18" and 23", and attached to the TV screen through static cling.

Pack-In Accessories

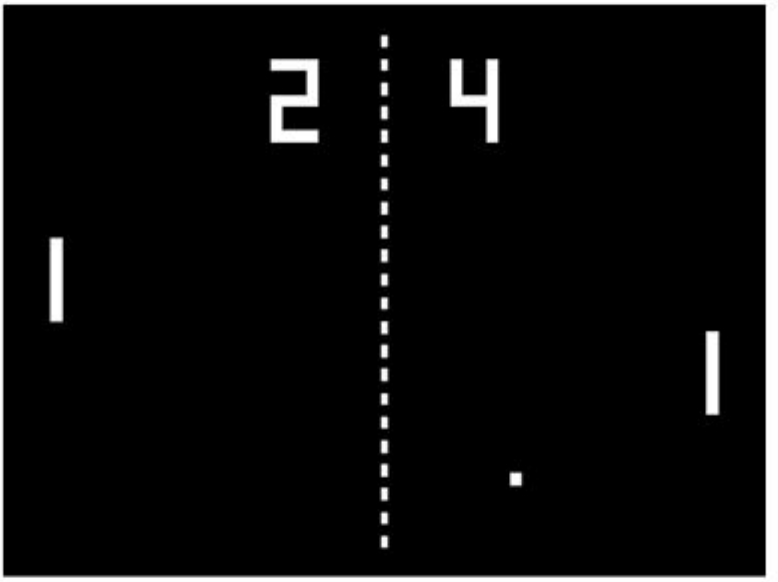
Magnavox compensated for the Odyssey's extremely basic, freeform gameplay with pack-ins to enhance the experience. Each system came with color screen overlays, poker chips, play money, dice, and various game boards and cards. These extra items allowed for 12 different games to be played out of the box.

Pong Consoles

1975

Launch price: Sears Tele-Games *Pong*, $98.95	**Systems sold:** 5+ million (est.), all models
Processor: "*Pong* on a chip" variants	**RAM:** N/A
Colors: 2 to 8, depending on chipset	**Total *Pong* models:** 300+

Atari's first product was *Pong*, an unofficial arcade cabinet adaptation of the Magnavox Odyssey's electronic tennis game. Atari's version greatly improved upon the original, adding a score tracker, sound, and more refined gameplay. *Pong* became a smash hit in arcades and bars, which led Atari to partner with Sears to bring out a home version, released in 1975 as the Sears Tele-Games *Pong*. The home version also became a huge hit, and its success led to numerous *Pong* clones and helped to spark the rise of the video game industry.



The Color TV-Game 15 offered 15 variations of *Pong* and retailed for ¥15,000 in 1977.

Nintendo TV-Games

Pong wasn't just a phenomenon in the United States; it also took off in Japan and Europe, where local companies produced their own *Pong* consoles. In Japan, one of the most popular *Pong* systems came from Nintendo, a longtime toymaker that had begun branching out into video games. Its Color TV-Games line included two *Pong* consoles, a *Breakout* clone, a racing game, and a computer that played the strategy game *Othello*.

The 2000 was the first Odyssey to offer a single-player mode for *Pong*.

The Telstar line included models with color graphics, light guns, and even a cartridge-based system.

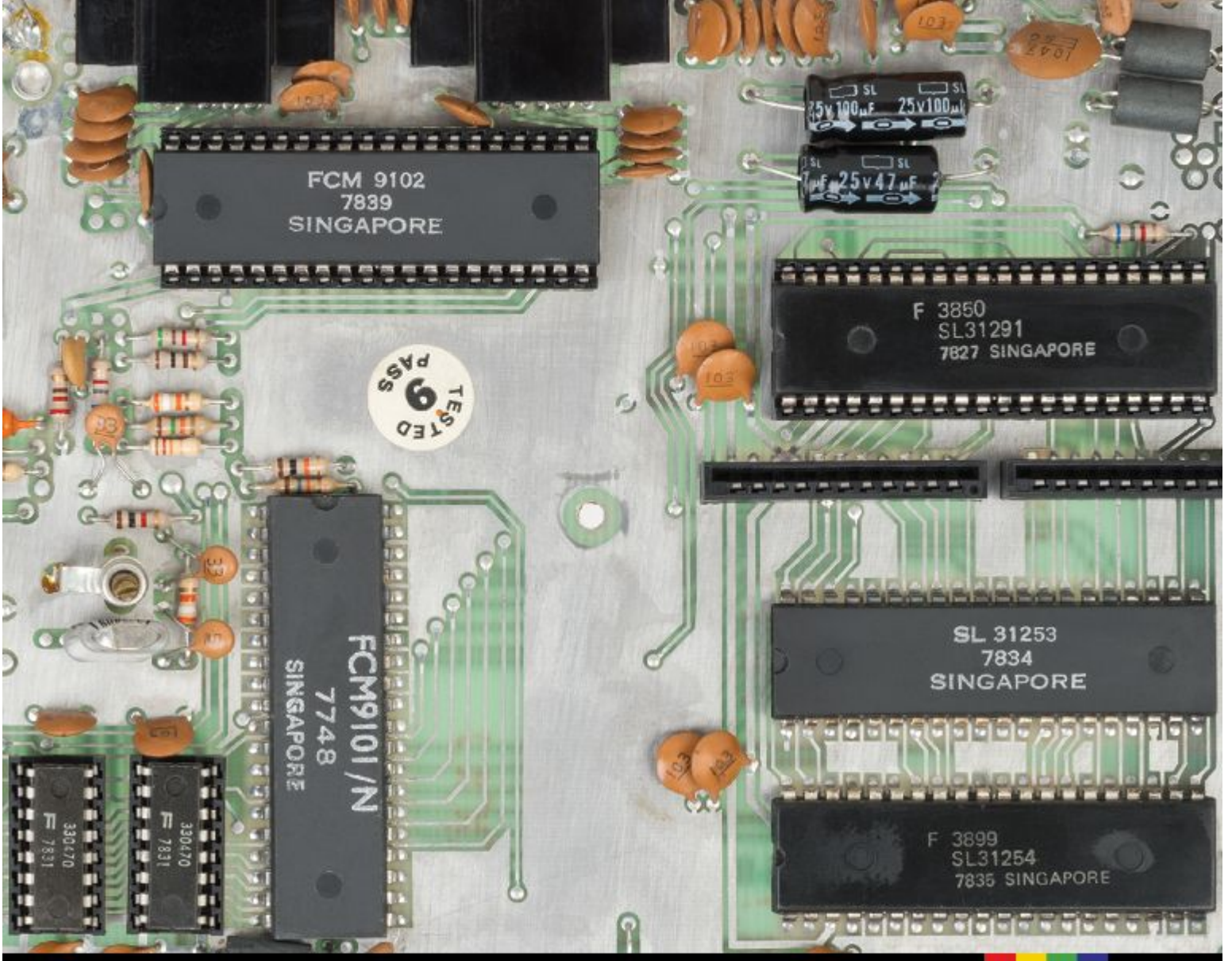
The Odyssey and Coleco Telstar Series

By 1975, Magnavox had discontinued the original Odyssey and began producing a series of streamlined Odyssey systems. Some of these dedicated *Pong* consoles (like the Odyssey 2000 above) used the General Instruments AY-3-8500, a "*Pong* on a chip" that incorporated all of the logic and circuits for *Pong* into one integrated circuit. The first to use this chip was Coleco, a toymaker whose line of Telstar systems would become one of the best-selling series of *Pong* consoles.

The Crash of 1977

The simplicity of the "*Pong* on a chip" integrated circuit opened the floodgates for electronics manufacturers to produce their own *Pong* consoles. *Pong* was so popular and so easy to produce that, by 1977, the market was flooded with nearly identical systems. When consumer fatigue set in and the systems stopped selling, companies dumped their *Pong* consoles and left the industry. The result was the first market crash and the end of the *Pong* era. Luckily, a new generation of gaming consoles had begun to emerge that would quickly revitalize the industry.

The Montiverdi TV Sports was just one of the many uninspired *Pong* consoles that offered multiple *Pong* game modes as well as light-gun shooting.



Second Generation

Technological innovations led to more dynamic video game experiences in the second generation; new microprocessors that ran code from ROM cartridges meant one console could play a theoretically limitless variety of games. While these new consoles took off in homes, people also flocked to arcades to play games that had unmatched graphics, sound, and gameplay. Sales of video games and hardware grew tremendously in a very short period of time, which caused a gold-rush effect that brought in a multitude of different manufacturers and developers to the low-entry market. This golden age would not last long, however; the influx of competing companies laid the groundwork for the biggest disaster the video game industry has ever seen.

Fairchild Channel F System II motherboard (above), APF MP1000 motherboard (opposite)

Fairchild Channel F

1976

Launch price: $169	**Systems sold:** 250,000–350,000 (est.)
Processor: Fairchild F8 at 1.79 MHz	**RAM:** 64 bytes **VRAM:** 2 KB
Colors: 8	**Games released:** 26

The Channel F was the first true video game console, as it was the first to use removable, programmable media in conjunction with a microprocessor. Built by Fairchild Semiconductor, the console was seen as a platform to directly sell its 8-bit microprocessor in the emerging games industry. On release, the Channel F was a step up from dedicated *Pong* consoles but never quite caught on due to Fairchild's poor understanding of the gaming and retail markets. The Channel F lacked the innovative action games of its later rival, the Atari 2600, and when console sales stagnated, Fairchild pulled out after only two years on the market.

The Channel F had two built-in games: *Hockey* and *Tennis*.

The original Channel F played game sounds via a built-in speaker, rather than through the TV.

Zircon International took over selling the Channel F in 1979 and released the console's six final games.

Channel F System II

Fairchild withdrew from the video game industry in 1978, shortly after it had just completed a remodeled Channel F. This new streamlined version, the System II, now played sound through the TV speaker and had controllers that could be removed. The system and Fairchild's entire Channel F inventory were sold to Zircon International in 1979, which continued to sell the system until the video game crash.

The Channel F's unique controller featured a single knob, which could be pushed down, pulled up, moved around like a joystick, and even rotated like a paddle.

RCA Studio II

1977

Launch price: $149	**Systems sold:** 15,000–25,000 (est.)
Processor: RCA 1802 at 1.78 MHz	**RAM:** 512 bytes
Colors: 2 (black and white)	**Games released:** 11

The Studio II was the second console to use cartridges and the first and only system released by RCA. The console was based on a low-cost consumer computer concept that RCA developed in the early 1970s, which was later updated into a game and educational system. However, its origins left the Studio II with an outdated design that was built around black-and-white graphics and keypad-based controls. The Studio II lacked the color graphics and fun action games of other new cartridge systems, and it even felt less advanced than some *Pong* consoles. After a year of incredibly low sales, RCA discontinued the Studio II and pulled out of the gaming market.

The RCA Studio II came with five built-in games: *Addition*, *Bowling*, *Freeway*, *Doodle*, and *Patterns*.

Coleco Telstar Arcade

1977

Launch price: $99	**Systems sold:** 40,000–60,000 (est.)
Processor: MOS MPS-7600 (on cartridge)	**RAM:** N/A
Colors: 5	**Games released:** 4

The Telstar Arcade was a spin-off of Coleco's line of dedicated *Pong* Telstar systems. The console combined *Pong*, shooting, and racing into a single triangular case and could offer multiple game variations with its use of interchangeable cartridges. Each cartridge contained an advanced version of the "*Pong* on a chip" integrated circuit and could run custom code that allowed for unique games using a pool of fixed assets. However, the Telstar Arcade offered little value over much cheaper *Pong* consoles and was outclassed by the new Channel F and Atari 2600. Coleco phased out the Telstar Arcade after just a year of sluggish sales.

Before making video games, Coleco produced leather goods, toys, and plastic pools.

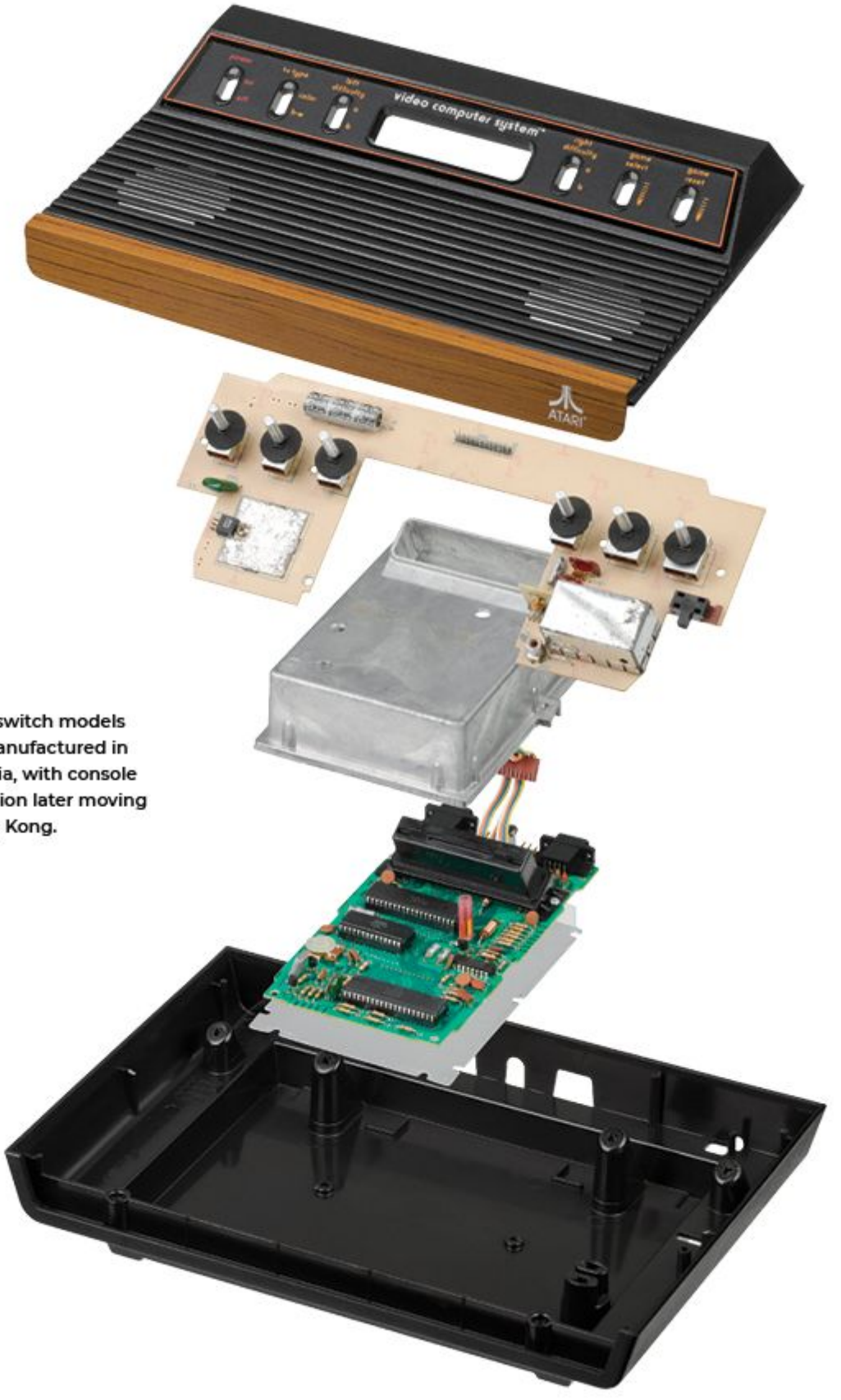
Atari 2600

1977

Launch price: $169–$199	**Systems sold:** 25 million (est.)
Processor: MOS 6507 at 1.19 MHz	**RAM:** 128 bytes
Colors: 128	**Games released:** 450+

The 2600 was Atari's first cartridge-based system and follow-up to a line of dedicated *Pong* consoles. Design of the Atari 2600 began in the mid-1970s and was limited by component costs that led to severe RAM restrictions. The resulting quirky hardware required a variety of tricks, exploits, and workarounds to fully use, but Atari's young and enthusiastic programmers were up to the task. The 2600's unique and action-oriented games wowed players, and later, exclusive arcade ports and the advent of third-party games pushed the system far ahead of the competition. The console defined the second gen and remains one of the most iconic systems of all time.

Originally launched as the Atari Video Computer System (VCS), the console was rebranded as the 2600 in 1982.



Early 6-switch models were manufactured in California, with console production later moving to Hong Kong.

Atari 2600 Console Variations

Atari released multiple hardware revisions and variants of the 2600 over its lifetime. The rebranded Video Arcade variants were created specifically for Sears' Tele-Games line, while others (Atari's 4-switch models) were the result of economization and the streamlining of internal components. The final remodel came in 1986 with the 2600 Jr, a drastically smaller model that sold for less than $50.

The 2700's wedge design would later be used as the basis for the Atari 5200.

Atari 2700 Prototype

The Atari 2700 was an unreleased 2600 variant that replaced its toggle switches with touch-sensitive controls and added radio frequency (RF) wireless capabilites. The updated wireless controllers ran off a single 9V battery and featured joysticks that could be twisted like paddles. Though the system was fully designed and ready for production, it was canceled after testing raised concerns about the 2700's RF signal strength and its ability to affect nearby consoles and wireless devices.

Bally Professional Arcade 1977

Launch price: $299	**Systems sold:** 40,000–60,000 (est.)
Processor: Zilog Z80 at 1.79 MHz	**RAM:** 4 KB
Colors: 256	**Games released:** 28

The Professional Arcade was the first and only console by Bally, an amusement company known for its pinball and slot machines. The system was more expensive than competing consoles but offered the ability to create and save BASIC programs onto cassettes with an inexpensive adapter. This feature produced a small, dedicated fan community of hobbyist programmers who created and traded their own games. However, despite its enthusiastic fans, high failure rates, poor retail presence, and limited advertising led to low sales, which resulted in Bally selling the system and its rights to Astrovision in 1980, which also had little success with the console.

The Professional Arcade was also known as the rebranded Astrocade.

PC-50x Series

1977

Launch price: Varied by system (average ≈$149)	**Systems sold:** 1+ million (est.), all models
Processor: On cartridge, various AY-3-8xxx chips	**RAM:** N/A
Colors: 8	**Games released:** 8 multigame cartridges

The PC-50x Series was a hardware standard that was used primarily by Hong Kong electronics manufacturers in the late 1970s. Similar to the Coleco Telstar Arcade, the cartridge housed the system's processor, and each cartridge contained a different General Instruments chip. These second-generation "*Pong* on a chip" GI processors contained more advanced versions of *Pong*, shooting, tank, or racing games. Up to 10 different play modes were available on each cartridge, and a PC-50x Series console can easily be identified today by its 10-button game selectors. The systems were sold throughout Europe until the early 1980s, where the gaming market was slower to adopt American-made consoles and had avoided a *Pong*-console crash.

The PC-50x Series lineup included more than two dozen different models.

Magnavox Odyssey²

1978

Launch price: $179	**Systems sold:** 2 million (est.)
Processor: Intel 8048 at 1.79 MHz	**RAM:** 64 bytes **VRAM:** 128 bytes
Colors: 12	**Games released:** 50+

The Odyssey² was the cartridge-based successor to Magnavox's original Odyssey. The large system was unique for its built-in membrane keyboard, which, though underutilized, provided the Odyssey² with more functionality than most other consoles. However, the Odyssey² lacked the third-party support of its competitors, and many games were visually similar due to heavy reuse of built-in art assets. While a modest seller in America, the console was a contender in Europe, where it was sold as the Philips Videopac G7000. It would be Magnavox's last console, as the company pulled out of the industry in 1984 following the video game crash.

Plans for an Odyssey³ were finalized, but it was canceled due to the video game crash.

Despite its enormous size, the Odyssey² was almost completely empty inside.

APF MP1000

1978

Launch price: $169	**Systems sold:** 50,000+ (est.)
Processor: Motorola 6800 at 0.89 MHz	**RAM:** 1 KB
Colors: 64	**Games released:** 12

The MP1000 was a game console released by APF Electronics, a New York company known for its calculators and popular line of *Pong* consoles. The shift from *Pong* to the microprocessor- and cartridge-based MP1000 was a big leap for APF, which took on heavy losses to develop the hardware and create games for the system. With the rapid downturn in the calculator and *Pong* markets—plus the failure of its PeCos One personal computer—the cash-strapped APF struggled to support its new console with advertising and a wide distribution. After an underwhelming reception, APF pivoted to marketing the MP1000 as a computer with a keyboard add-on.

Every MP1000 came with the built-in game *Rocket Patrol.*

Early home computers often used common cassette tapes to store and load programs.

APF Imagination Machine

The Imagination Machine was a keyboard add-on that turned the MP1000 into a full-fledged computer. The add-on contained an extra 8 KB of RAM and a cassette drive for loading and saving BASIC programs. System expandability was offered through an optional dock that sat behind the keyboard, which could be outfitted with another 8 KB of memory or connected to an acoustic modem or floppy disk drive.

Priced at only $599 (which included the MP1000), the Imagination Machine was an inexpensive computer when it debuted in late 1979. A new streamlined design, the Imagination Machine II, which combined the keyboard and game console into a single unit, was completed in 1981 but was never released, as financial issues caused the closure of APF that same year.

VideoBrain

1978

Launch price: $499	**Systems sold:** 20,000–25,000 (est.)
Processor: Fairchild F8 at 1.79 MHz	**RAM:** 1 KB
Colors: 16	**Games released:** 15+

The VideoBrain was a home computer developed by Umtech, a Californian computer manufacturer. The system came with two joysticks and prominently used ROM cartridges that ran a small library of business, educational, and gaming titles. With a simplified interface and a reliance on ready-made software, Umtech envisioned the VideoBrain as an easy-to-use computer for all ages. However, at the time the home computer market was led by hobbyists who valued versatility, BASIC programming support, and cheap writeable media like cassettes. Unable to find an audience, the VideoBrain was discontinued within a year.

Designed by a former Fairchild engineer, the VideoBrain used the same F8 processor as the Channel F.

Interton VC 4000

1978

Launch price: 500 DM (Deutsche Marks)	**Systems sold:** 50,000+ (est.), VC 4000 only
Processor: Signetics 2650A at 0.89 MHz	**RAM:** 37 bytes
Colors: 8	**Games released:** 35+

The VC 4000 was a European console released by the German electronics company Interton and was the first in a series of clone consoles released by multiple companies throughout Europe and Asia. These systems were based on Philips' line of Signetics chips, and they used a ready-made console design that was available to other manufacturers and as a "build it yourself" computer kit. The VC 4000 and its clones shared a game library made of play-alikes of popular games and arcade titles. The family of systems failed to make a lasting impact on the market, and most were abandoned after their initial release.

Some VC 4000 clones included the Grundig Super Play 4000, Hanimex HMG-1292, and Acetronic MPU 1000.

Unisonic Champion 2711

1978

Launch price: $149	**Systems sold:** 500–1,000 (est.)
Processor: GI AY-3-8800 at 2 MHz	**RAM:** 256 bytes
Colors: 4	**Games released:** 4 multigame cartridges

The Champion 2711 was an extremely rare casino-based console created by Unisonic, an American electronics company that sold calculators and *Pong* consoles in the 1970s. Created around a graphics processor that could display only static columns of text, numbers, symbols, and playing cards, the Champion 2711 was mainly limited to card games. *Baccarat* and *Blackjack* were built into the system, while titles such as *Poker*, *Bingo*, and *Concentration* were available separately. The system was sold only in limited quantities for a brief period, as Unisonic quickly exited the gaming market after its release, likely due to the collapse of the American *Pong* market.

With sales in just the hundreds, the obscure Champion 2711 is likely the rarest console ever released. Only a few listings have ever appeared on the auction site eBay in the past 15 years.

Microvision

1979

Launch price: $49	**Systems sold:** 70,000+ (est.)
Processor: Intel 8021 or TI TMS1100 (on cartridge)	**RAM:** 64 bytes
Colors: 2 (black and white)	**Games released:** 12

The Microvision was the first handheld cartridge-based game console. Built by the American toy and board game company Milton Bradley, the Microvision was an ambitious idea held back by the technology of the late 1970s. Due to the limitations with available battery-powered processors and liquid crystal displays (LCDs), the Microvision ran from 9V batteries and only supported a resolution of 16 by 16 pixels. Nevertheless, expectations for a handheld device at the time were low, and people enjoyed the Microvision's quick, simple games. After strong initial sales, interest died down, and the device was discontinued in 1981.

The Microvision's game cartridges covered most of the system itself.

Atari 800

1979

Launch price: $999	**Systems sold:** 2.5–3.0 million (all models)
Processor: MOS 6502 at 1.79 MHz	**RAM:** Expandable, 8 KB to 48 KB
Colors: CTIA: 128, GTIA: 256	**Games released:** 1,000+

The Atari 800 was the first in a line of 8-bit home computers created by the gaming company Atari. Like the VideoBrain, Atari's 8-bit computers mainly offered its first-party programs and games on cartridges, though floppy disk and cassette drives were also available. With superior graphics, sound, and gaming support compared to contemporary computers, Atari's 8-bit line earned the reputation as hobbyist computers that played games rather than serious business machines. When the Commodore 64 arrived and established itself as a premiere gaming platform, Atari's computer growth stagnated and never regained its former prominance.

The Atari 800 offered two cartridge slots and four controller ports.

Both the 800XL and the 130XE featured built-in Atari BASIC.

Atari XL and XE Computers

Atari's 8-bit computer line had multiple revisions during its 12 years on the market. The short-lived Atari 1200XL was released in 1983 and cost more than the older 800 model, but it was criticized for having fewer features. The 1200XL was quickly followed by the Atari 600XL and 800XL, which had smaller, more streamlined designs that competed directly with the Commodore 64 and VIC-20. Atari's 8-bit computers were updated again in 1985 to the 65XE and 130XE, which reduced production costs even further while expanding the built-in memory capacity to 128 KB. The last in the lineup was a consolized version of the XE, featured on page 100.

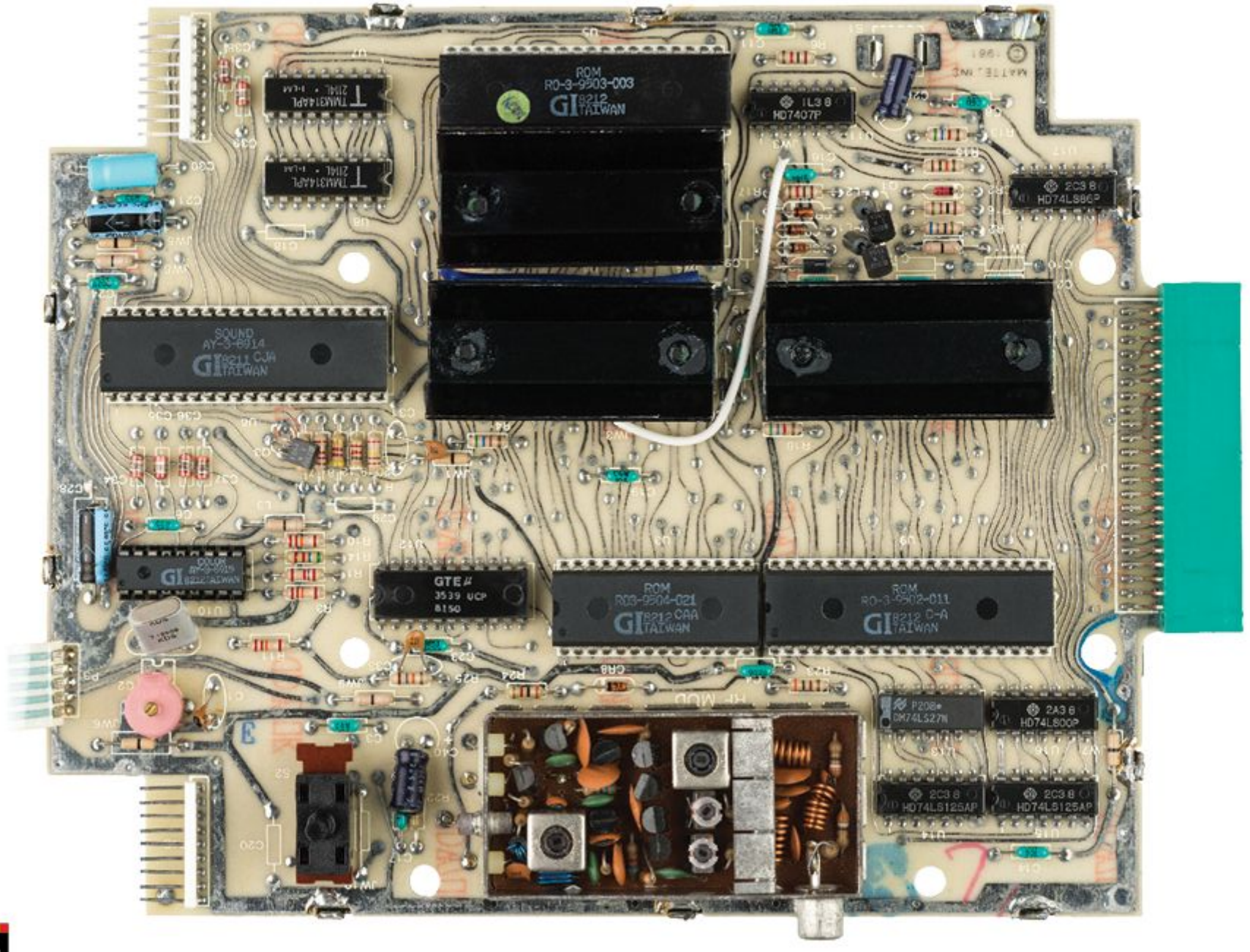
Intellivision

1980

Launch price: $269–$299	**Systems sold:** 3+ million
Processor: GI CP1610 at 0.895 MHz	**RAM:** 1,456 bytes
Colors: 16	**Games released:** 125+

The Intellivision was a console created by the toy company Mattel that acted as a sophisticated and more expensive alternative to the Atari 2600. Mattel highlighted the differences between these two consoles with an aggressive ad campaign, directly comparing the Intellivision's superior sound and more detailed graphics to the 2600's. These ads, along with a strong library of sports and strategy titles, positioned the Intellivision as Atari's main rival. Mattel's game console chipped away at the 2600's market share, and while not able to truly compete with the juggernaut Atari, the Intellivision beat other systems to come in second place.

The Intellivision was test-marketed in 1979 and released nationwide in 1980.


ROM
RO-3-9503-003
GI 8212 TAIWAN
TMM314APL
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HD7407P
2C38
HD74LS86P
SOUND
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GI 8211 CJA TAIWAN
GTE
3539 UCP
8150
ROM
RO3-9504-021
GI 8212 CAA TAIWAN
ROM
RO-3-9502-011
GI 8212 C-A TAIWAN
P208
DM74LS27N
2A38
HD74LS00P
2C38
HD74LS125AP
2C38
HD74LS125AP

Fewer than 4,000 Mattel Keyboard Components made it to market, and even fewer were actually bought or still exist today.

Keyboard Component

The Intellivision Keyboard Component was an infamous and incredibly rare add-on for the console that turned it into a computer. It was announced early on in the Intellivision's life but was beset by delays as Mattel struggled to make the unit cheaper to manufacture. The first Keyboard Components were sold in a very small test market in late 1980, and later sold only in a few stores in Seattle and New Orleans. Mattel's inability to bring the add-on to the mass market resulted in legal actions and warnings from the FTC, as Mattel had advertised the Intellivision as being computer capable. Because the Keyboard Component was too expensive and impractical for a large rollout, Mattel discontinued it and released a much simpler, stripped-down version in 1982.

Intellivision II and Mattel's Fate

In early 1983, Mattel released the updated Intellivision II, a compact, modern-looking redesign of the original Intellivision that featured removable controllers and an external power supply. Months after the console's release, the industry was hit by the video game crash, which caused considerable damage to Mattel's gaming division. Even after dramatic price cuts, layoffs, and internal restructuring, Mattel suffered hundreds of millions in losses by the end of 1983, which led the company to sell off the Intellivision line and quit the gaming industry.

Add-ons for the Intellivision included a voice-synthesis module, a modem, a music keyboard, a computer keyboard expansion, and even an adapter that played Atari 2600 games.

Nintendo Game & Watch

1980

Launch price: $24.99–$34.99	**Systems sold:** 43 million
Processor: Various Sharp SM5xx	**RAM:** N/A
Colors: 2 (black and white, plus color overlays)	**Models released:** 50+

The Game & Watch series was a collection of more than 50 dedicated handheld and tabletop games that Nintendo produced over a 10-year period. The series was a clever reworking of pocket calculator technology, which used flickering, fixed graphics on an LCD screen to give the illusion of movement. The devices were low-powered, cheap, and drastically smaller than previous LED-based handhelds, and the design was quickly imitated by rival manufacturers. The Game & Watch series expanded over time to include dual-screen systems; a two-player Micro Vs. series; the full-color, mirror-based Panorama models; and the rare, see-through Crystal series.

The Game & Watch series was the birthplace of the iconic D-pad, first seen in the 1982 game *Donkey Kong* (shown opposite).

DONKEY KONG
GAME & WATCH
GAME A
ALARM
GAME B
ACL
TIME
START
JUMP
CONTROLLER
Nintendo®
AM 12:00

Epoch Cassette Vision

1981

Launch price: ¥13,500	**Systems sold:** 300,000–400,000 (est.)
Processor: NEC uPD77xC (on cartridge)	**RAM:** N/A
Colors: 8	**Games released:** 11

The Cassette Vision was a game console released exclusively in Japan by the toy company Epoch. Similar to the Telstar Arcade, the Cassette Vision placed its user controls on the system itself and used its game cartridges to hold the system's main processor. Graphics for the Cassette Vision were primitive and outdated, with low-resolution visuals that resembled early second-generation game systems and advanced *Pong* consoles. Despite these limitations, Epoch's inexpensive Cassette Vision and its small library of simple games connected with Japanese gamers and sold well, as did a cost-reduced mini version of the system that came out in 1983.

Epoch was a Japanese company most known in America for its LCD handheld systems in the early 1980s.

Entex Select-A-Game

1981

Launch price: $59	**Systems sold:** 5,000–15,000 (est.)
Processor: Hitachi HD38800 (on cartridge)	**RAM:** N/A
Colors: 2 (red and blue)	**Games released:** 6

The Select-A-Game was a portable game console from Entex, an American toy company known for its dedicated handheld and tabletop gaming systems in the early 1980s. Unlike those single-game devices, the Select-A-Game offered a variety of titles through interchangeable cartridges.

Like many other Entex sports handhelds, the Select-A-Game had dual controls that allowed two players to go head-to-head in most games. The system was short-lived; it was available for less than a year before Entex stopped production on additional games and a larger tabletop version.

Only six games were released for the Select-A-Game: *Baseball 4*, *Pinball*, *Pac-Man 2*, *Football 4*, *Basketball 3*, and *Space Invader 2*.

Commodore VIC-20

1981

Launch price: $299	**Systems sold:** 2.5 million
Processor: MOS 6502 at 1.02 MHz (NTSC)	**RAM:** 5 KB (expandable)
Colors: 16	**Games released:** 400+

The VIC-20 was a home computer from Commodore, an American electronics manufacturer that had shifted from calculators to the nascent computer market. Commodore focused heavily on a low-cost product offered to the widest audience and wanted its VIC-20 to be available at common retailers and department stores.

Compared to contemporary computers, the VIC-20 was compact, affordable, and easily attainable. A hit with young hobbyists and families, the VIC-20 introduced an entire generation to personal computing but its amazing success would soon be overshadowed by Commodore's next computer, the Commodore 64.

The VIC-20 was named after its custom graphics and sound processor, which stood for "Video Interface Chip."

Emerson Arcadia 2001

1982

Launch price: $129	**Systems sold:** 20,000–30,000 (est.)
Processor: Signetics 2650A	**RAM:** 1 KB
Colors: 8	**Games released:** 24 (Arcadia 2001 only)

The Arcadia 2001 was a console distributed by the Emerson Electric Company in the United States. Like the Interton VC 4000, the Arcadia 2001 was the beginning of a line of European and Asian clone consoles based around Philips' Signetics chips, though this series had more RAM and a slightly better video processor. With its late 1982 release, the Arcadia 2001 presented an outdated and uninspired experience as new, powerful systems like the Atari 5200 and ColecoVision were coming out. In this heavily competitive market, the Arcadia 2001 went unnoticed, and Emerson quickly dumped the system and left the gaming market altogether.

Other systems in the Arcadia 2001 clone family included the Schmid TVG 2000, Tchibo Tele Fever, and Tunix Home Arcade.

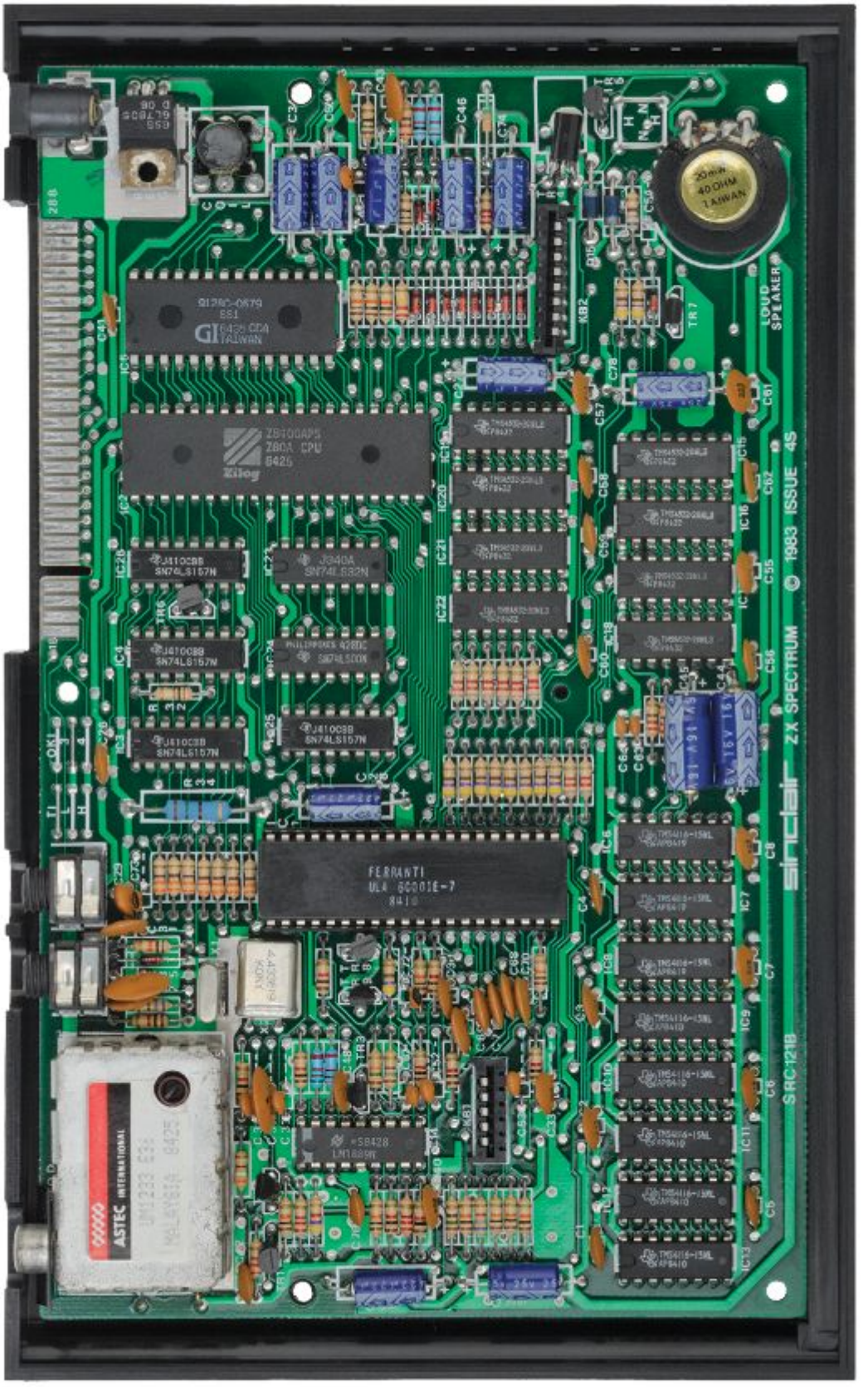
ZX Spectrum

1982

Launch price: £125 (16 KB), £175 (48 KB)	**Systems sold:** 4–5 million
Processor: Zilog Z80A at 3.5 MHz	**RAM:** 16 KB, 48 KB, or 128 KB (expandable)
Colors: 15	**Games released:** 1,500+

The ZX Spectrum (pronounced "zed-x") was the third and most successful in a line of Zilog Z80–based computers from Sinclair Research, a British electronics company. Sinclair prioritized affordability for its computers, offering minimal features while still being comparable in power to its peers. When the ZX Spectrum launched in 1982, the inexpensive computer established itself with young programmers and gamers who created a vibrant market of self-made games. One of the most popular 8-bit computers in Europe, the ZX Spectrum spawned a line of revised and upgraded models throughout the 1980s before being officially discontinued in 1992.

Multiple ZX Spectrum models were released over the system's life, some of which included 128 KB of RAM and built-in cassette drives.


sinclair ZX SPECTRUM © 1983 ISSUE 4S
LOUD SPEAKER
SRC121B
FERRANTI
ULA 6C001E-7
Zilog
Z80A CPU
6425
ASTEC INTERNATIONAL

Commodore 64

1982

Launch price: $595	**Systems sold:** 17+ million
Processor: MOS 6510 at 1 MHz	**RAM:** 64 KB
Colors: 16	**Games released:** 2,000+

The Commodore 64, released as a follow-up to the popular VIC-20, was a powerful and capable computer that debuted at a relatively low price. It featured 64 KB of memory, an improved version of the 6502 processor, and custom MOS chips for graphics and sound. The computer was well received at launch and gained a considerable following for its prowess as a gaming system. Subsequent price cuts, wide retail availability, features more advanced than other computers, and the system's popularity as a gaming platform made the Commodore 64 a hit, and it went on to become the best-selling computer of all time.

As the owner of the chip manufacturer MOS, Commodore had easy access to low-cost, custom chips.

The Commodore 64C was a remodeled Commodore 64 in a slimmer case.

The C64 Games System (1990) was a stripped-down, cartridge-only version of the Commodore 64 created to appeal to the console market.

Commodore 64C and C64 Games System

The Commodore 64's incredible popularity kept the computer in production for more than a decade. Over its lifetime, the C64 received multiple updates and spin-offs, such as the 1987 Commodore 64C, which ditched the original C64's iconic breadbin design for more modern aesthetics. Three years later, Commodore tried to repackage the C64 as a gaming console in Europe with the C64 Games System. A standard C64 with the keyboard removed and the cassette tape port blocked off, the C64 GS's compatibility with existing software was drastically limited. An infamous flop, the system sold so few units that it's now a holy grail for many retro console collectors.

Vectrex

1982

Launch price: $199	**Systems sold:** 75,000–100,000 (est.)
Processor: Motorola 68A09 at 1.6 MHz	**RAM:** 1 KB
Colors: 2 (black and white)	**Games released:** 28

The Vectrex was an unusual game console that featured a built-in 9-inch television screen. The system's dedicated screen was necessary for rendering the Vectrex's vector graphics, which displayed smooth white lines against a black background and were seen in arcade games like *Battlezone* and *Asteroids*. The result was unique compared to conventional sprite-based graphics but was limited to black and white, which the Vectrex tried to remedy with color screen overlays. While the console had potential and a dedicated fan base that's still active today, the 1983 video game crash cut the system's life short, and the Vectrex was discontinued in 1984.

The Vectrex's controller stored away under the screen when not in use.

The Vectrex used a standard black-and-white television tube that was modded for vector graphics.

ColecoVision

1982

Launch price: $179–$199	**Systems sold:** 2+ million
Processor: Zilog Z80A at 3.58 MHz	**RAM:** 1 KB **VRAM:** 16 KB
Colors: 16	**Games released:** 130+

Almost four years after the *Pong* crash ended Coleco's run of Telstar systems, the company returned to the TV gaming market with the ColecoVision. The new console's graphics were far beyond older systems such as the 2600 and Intellivision, and each console included a high-quality port of *Donkey Kong*, one of the year's hottest arcade games. The combination quickly established the ColecoVision as a must-have system, and sales took off despite looming market troubles. By early 1984, however, the market had collapsed, and Coleco was forced to discontinue the system in 1985. Later troubles would end the company altogether in 1988.

With a Z80A CPU and an advanced video processor, the ColecoVision's performance was more comparable to early third-generation consoles.

The ColecoVision controllers could support number-pad overlays, which slid in through a small slit on the side.

While Modules #1 and #3 expanded functionality, Module #2 (page 303) was just an alternate game controller.

ColecoVision Expansion Module #1

Though it may seem crazy today, both Coleco and Mattel released add-ons that allowed users to play Atari 2600 games through their systems. At the time, Atari compatibility was seen as positive, given the 2600's massive success and large game library. Coleco's Expansion Module #1 used off-the-shelf parts and a clone of the 2600's custom Television Interface Adapter (TIA) chip to play 2600 cartridges. The expansion resulted in a $350 million lawsuit from Atari, which led to a $500 million counterclaim from Coleco alleging antitrust law violations. The two companies settled out of court, and Coleco agreed to pay licensing fees and royalties to Atari.

Coleco Expansion Module #3 ADAM

Coleco's ADAM computer platform was released in 1983 as either an add-on to the ColecoVision or as a dedicated system. The ADAM computer played ColecoVision games, supported BASIC programming, and had a small library of productivity and educational software. Like Mattel's Intellivision Keyboard Component, the ADAM computer was difficult to bring to market. Production and reliability issues plagued its development, causing Coleco to miss multiple launch dates, and the few units that did hit the market were often returned due to faulty hardware. The ADAM was a disaster that cost Coleco tens of millions of dollars, which, coupled with the 1983 crash, resulted in the company leaving the video game and computer industries.

Every ADAM shipped with a large daisy wheel printer, which housed the power supply for the entire computer.

Atari 5200

1982

Launch price: $199–$249	**Systems sold:** 1+ million
Processor: Custom MOS 6502 at 1.79 MHz	**RAM:** 16 KB
Colors: 256	**Games released:** 69

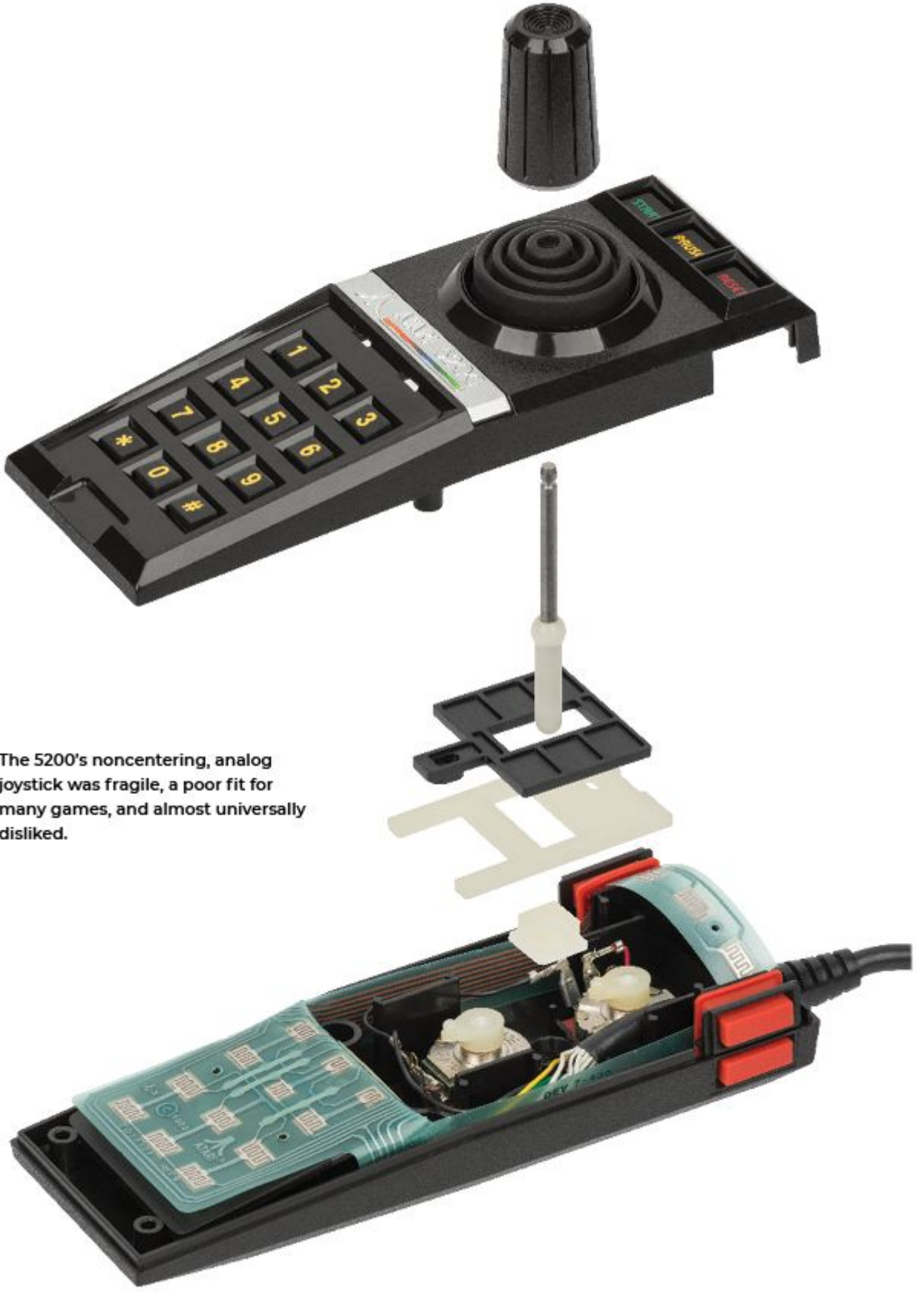
The Atari 5200 was a slightly modified version of Atari's 8-bit computer series repackaged into a game console. Despite the system's impressive graphics, sound, and Atari's strong brand name, the 5200 was ultimately a troubled console that failed to emulate the 2600's success. The 5200 lacked its own identity, due to most of its library being direct ports of Atari 8-bit games, which themselves were ports of arcade games available on every other system, including the 2600. With Atari and most game developers still focused on the popular 2600, the 5200 struggled to establish itself and was abandoned after the 1983 crash left Atari in shambles.

Rather than being a true successor to the 2600, Atari's 5200 served as a premium companion, offering higher-quality versions of many 2600 games.

The Atari 5200—one of the largest consoles ever made—included built-in controller storage.

Atari 5200 Trak-Ball Controller

The trackball was an alternative control scheme used by a handful of early 1980s arcade games such as *Missile Command* and *Centipede*. Many second- and third-generation home consoles had their own trackball controllers, though none were as large or excessive as the 5200's official Trak-Ball Controller.



The 5200's noncentering, analog joystick was fragile, a poor fit for many games, and almost universally disliked.

VTech CreatiVision

1982

Launch price: $295 (Australian)	**Systems sold:** 50,000–70,000 (est.)
Processor: Rockwell 6502 at 2 MHz	**RAM:** 1 KB **VRAM:** 16 KB
Colors: 16	**Games released:** 20

The CreatiVision was a hybrid computer and game console released by Hong Kong electronics company VTech in Europe, Asia, and Australia. While the system had decent hardware and gaming performance, the CreatiVision failed to stand out among a plethora of dedicated computers and consoles, and was eventually outclassed by rival products such as the Commodore 64 and ZX Spectrum. The CreatiVision also suffered from a small game library mostly made up of clones of popular games. After the CreatiVision's underwhelming sales, VTech abandoned the hybrid system to focus on dedicated computers and edutainment consoles.

The CreatiVision sold under a number of different names around the world. In Australia, it was known as the Dick Smith Wizzard.

Entex Adventure Vision

1982

Launch price: $79	**Systems sold:** 2,000–5,000 (est.)
Processor: Intel 8048 at 0.73 MHz	**RAM:** N/A
Colors: 2 (black and red)	**Games released:** 4

The Adventure Vision was a cartridge-based tabletop console from the American toy company Entex. The system's unique display used a strip of 40 red LEDs that were reflected onto a mirror oscillating at high speed, which gave the illusion of a full 150 by 40 dot image shown at 15 frames a second. This design gave the Adventure Vision a dramatic resolution boost over comparable dedicated LED devices but also made the system difficult to play in bright environments. Ultimately, the Adventure Vision was overlooked by most gamers and was able to sell only a small amount of units before the video game crash put Entex out of business.

The Adventure Vision is one of the rarest consoles for collectors, easily selling for more than $1,500 at auction.

Tomy Tutor

1982

Launch price: $149	**Systems sold:** 120,000–140,000 (est.)
Processor: TI TMS-9995NL at 2.7 MHz	**RAM:** 16 KB
Colors: 16	**Games released:** 40+

The Tomy Tutor was a personal computer developed by the Japanese toymaker Tomy, who had released it as the Pyūta in Japan in 1982. Based on a 16-bit Texas Instruments CPU, the Tutor was a standard home computer that offered BASIC and cartridge gaming, with a small library of titles developed by Tomy and Konami.

Marketed toward children as an easy-to-use educational tool, the Tutor struggled to gain a foothold in America, where it was overlooked in favor of popular computers from Atari and Commodore. It fared better in its native Japan, where it received two updated revisions, but Tomy ended support for the Pyūta in 1985.

Most Tomy Tutors/Pyūtas were sold in Japan, making the American version quite rare.

Mattel Aquarius

1983

Launch price: $159	**Systems sold:** 20,000–30,000 (est.)
Processor: Zilog Z80A at 3.5 MHz	**RAM:** 4 KB
Colors: 16	**Games released:** 44

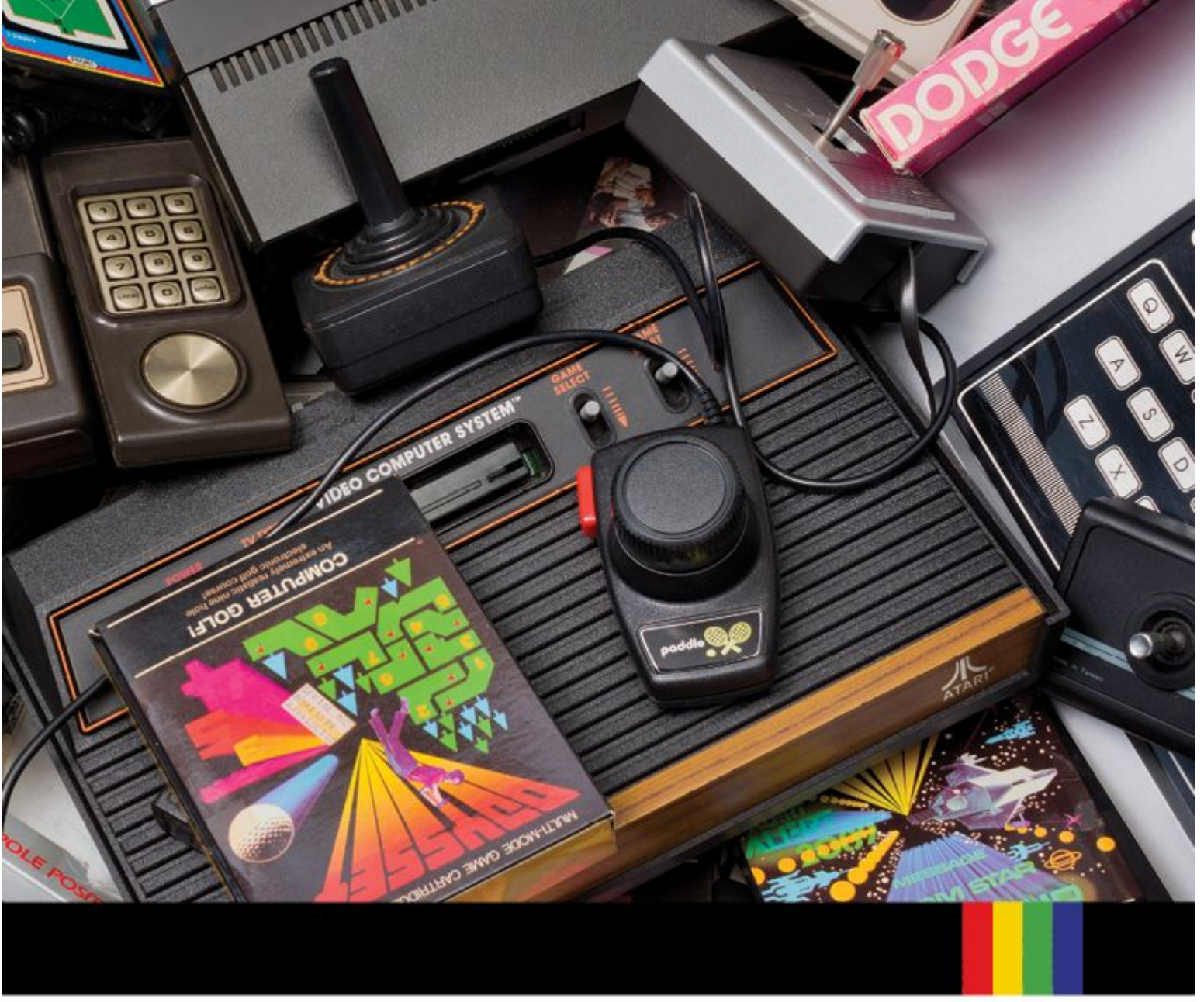
The Mattel Aquarius was an 8-bit computer sold by Mattel that was developed and produced by the Hong Kong electronics company Radofin, the manufacturer of Mattel's Intellivision. Upon the Aquarius' release in 1983, the computer was derided by reviewers for its lack of features, low specs, and extremely limited graphics capabilities. The Aquarius was a massive flop for Mattel, who gave up on the new computer after just a few months. Mattel paid Radofin out of their manufacturing contract and completely cut ties with the computer, which returned the Aquarius to Radofin, who had little success selling the system themselves.

Accessories for the Aquarius include a cassette deck, a thermal printer, RAM cartridges, and the Mini-Expander, which added game controller ports.

1983 Video Game Crash

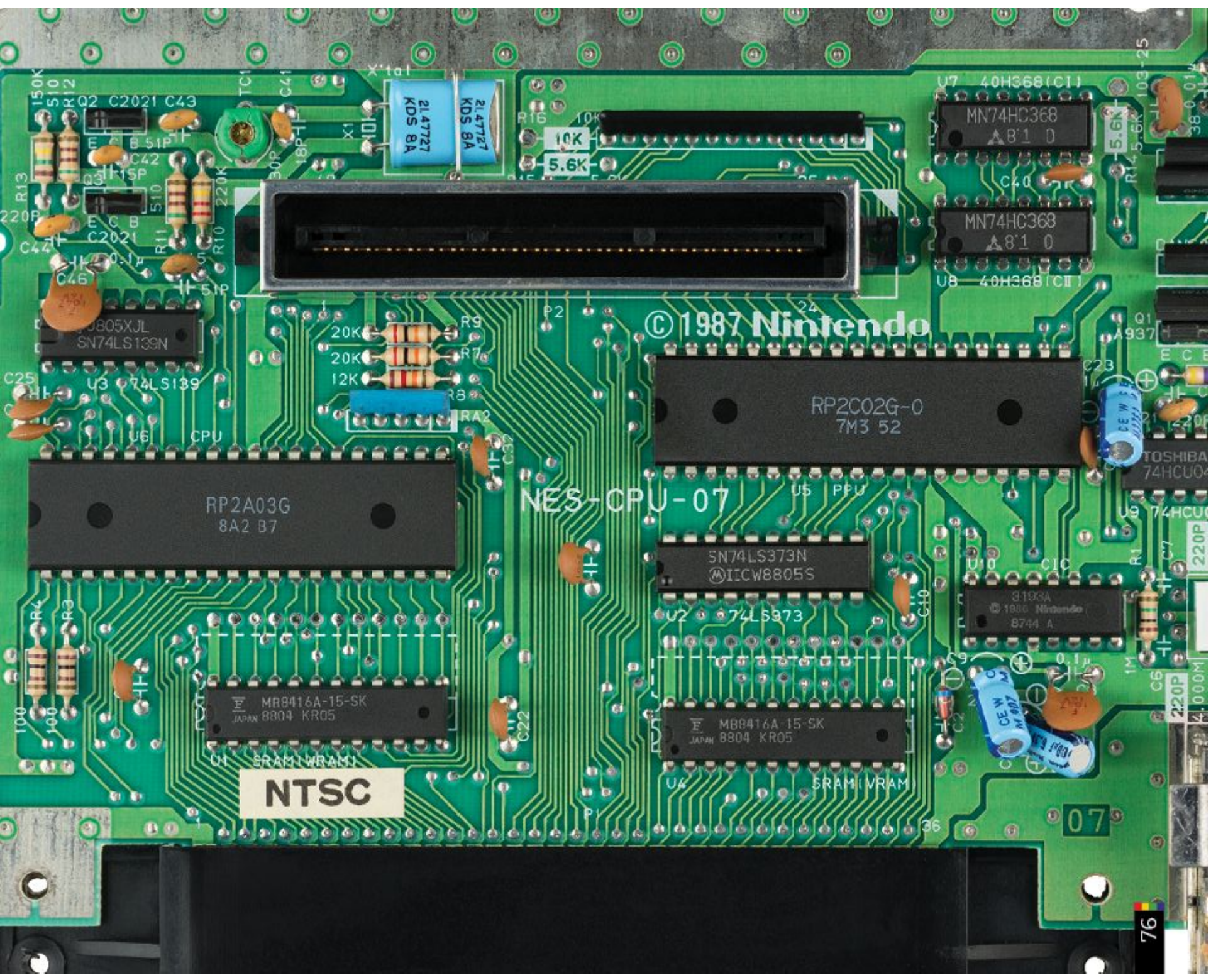
In 1982, the American gaming market was overtaken by severe overcrowding. The multitude of consoles and game publishers trying to chase Atari's success resulted in consumer confusion and a market flooded with low-quality games. Consumers were unsure of which systems to get and what games to buy, and many games they did buy were poorly made or not fun. Worse, even official and high-profile Atari games, such as *Pac-Man* and *E.T.* for the 2600, were critical and commercial disasters, souring the public perception of video games in general.

By the 1982 holiday season, the gaming market was completely oversaturated, and demand for games plummeted. This development was disastrous for companies that had overproduced for Christmas based on the previous year's sales, and many companies were forced to exit the market and dump their products en masse.



Retailers, stuck with an excess of games and hardware, drastically cut prices to move product. These low prices caused a death spiral; companies still in the market could not compete or stay profitable, which led them to exit the market and dump their products as well.

The fallout was severe; it took just a few months for America's hottest industry to become a wasteland. Third-party game publishers that survived moved to making computer games. Mattel and Magnavox discontinued their consoles and closed their video game divisions. Coleco moved away from video games to focus on its toy and computer lines. Atari went through multiple restructurings before being sold to new owners in 1984, and it would never recapture the success it had in its glory days. With the American leaders gone, the door was left open for the Japanese to come in and claim the industry.


© 1987 Nintendo
NES-CPU-07
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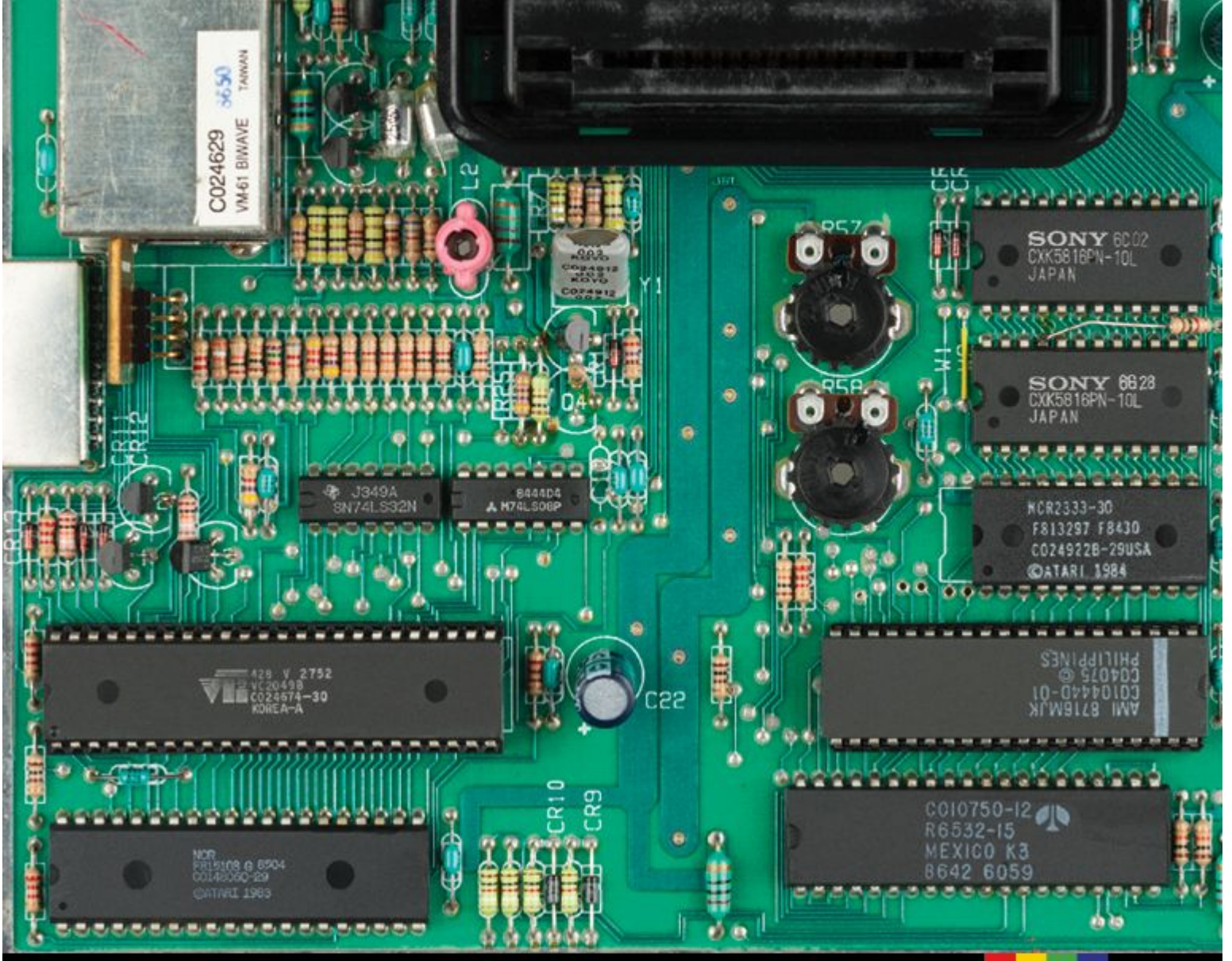


Third Generation

While North America's gaming market had just imploded, in Japan, local companies created their own thriving industry with original games and systems. Leading the Japanese console market was Nintendo, which brought its Famicom to the United States as the Nintendo Entertainment System (NES) in late 1985. The American gaming market was still dead following the crash, but Nintendo built interest for its NES console with first-party games such as *Super Mario Bros.* and *The Legend of Zelda*. Fueled by word of mouth, hit games from Japanese developers, and a legion of new young fans, the NES created a phenomenon that revitalized the gaming market. From there, Nintendo and other Japanese developers like Capcom and Konami took the industry to new highs, establishing Japan as console gaming's new leader.

Atari 7800 motherboard (above), NES motherboard (opposite)

Sega SG-1000

1983

Launch price: ¥15,000	**Systems sold:** 1+ million (est.)
Processor: NEC 780C at 3.58 MHz	**RAM:** 1 KB **VRAM:** 16 KB
Colors: 16	**Games released:** 70+

The SG-1000 was the first console from Sega, a Japanese amusement company known for its video arcade games. Released primarily in Japan, the SG-1000 started a new console generation that offered more complex video games with larger, more colorful, and more detailed sprite graphics. Sega's system faced heavy competition from Japan's burgeoning console market, and it was ultimately overshadowed by Nintendo's new system, the Famicom. Though the SG-1000 wasn't a complete failure, Sega continually modified and updated the system to remain competitive, eventually rereleasing it as the revamped Master System for its worldwide debut.

Sega began as an American business called Service Games that distributed slot machines and electromechanical arcade cabinets to US military bases in the 1940s.

In 1984, Sega also released a keyboard add-on for the SG-1000, which allowed for BASIC programming and limited computer functionality.

Sega SG-1000 Mark II

After the SG-1000's lukewarm reception, Sega quickly redeveloped the console and released the Mark II just a year later. The updated system was the same internally but featured a new aesthetic and a few tweaks, such as a front-facing expansion port and fully detachable controllers. The Mark II also copied some of the Famicom's design, replacing the joystick with joypads that could be stored on the console's sides.

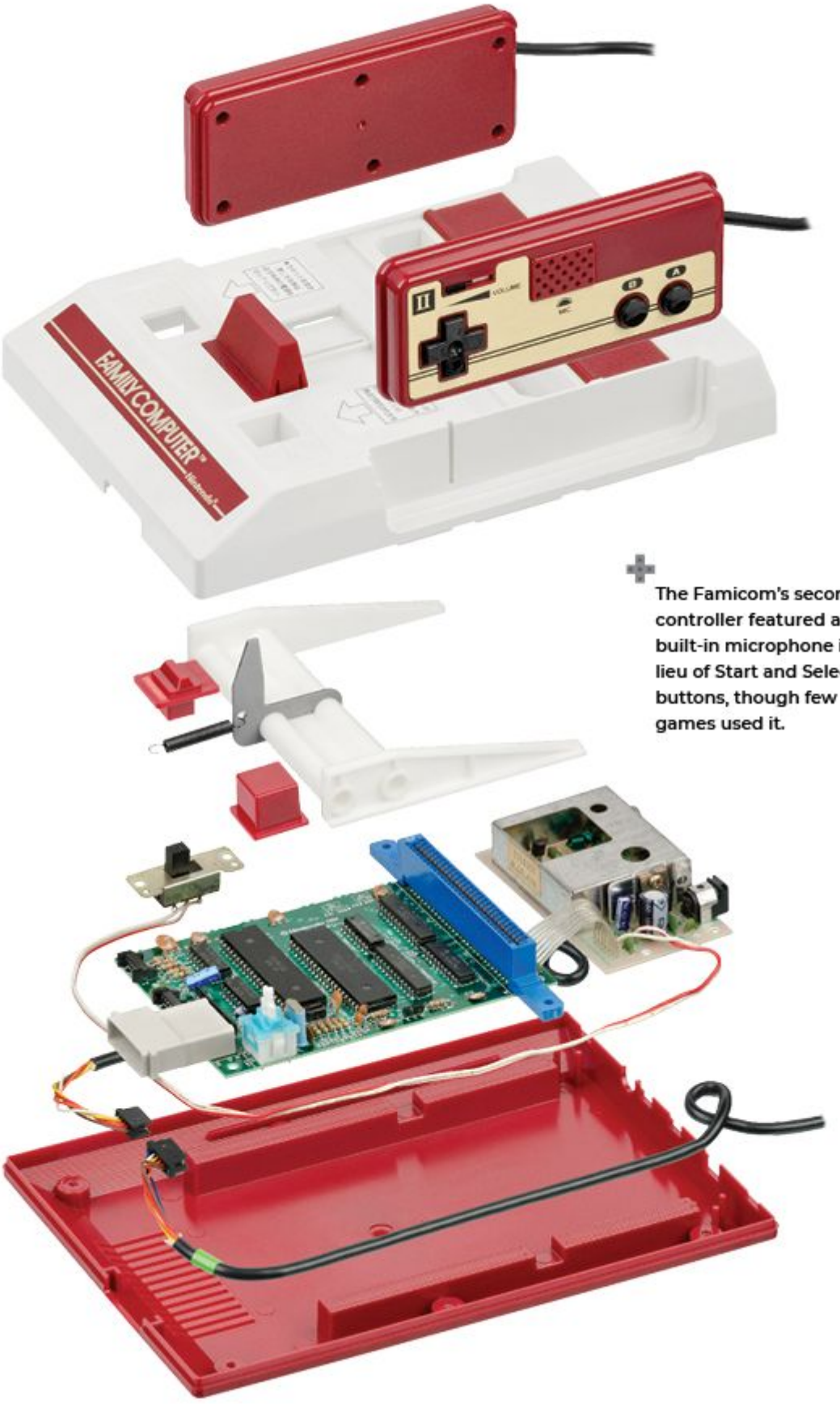
Nintendo Famicom

1983

Launch price: ¥14,800	**Systems sold:** 61+ million (includes NES)
Processor: Custom Ricoh 2A03 at 1.79 MHz	**RAM:** 2 KB **VRAM:** 2 KB
Colors: 54	**Games released:** 1,000+

The Famicom, short for "Family Computer," was Nintendo's first game console and released exclusively in Japan. Despite heavy competition from other new 8-bit consoles and computers, the Famicom stood out with a strong lineup of first-party games and an innovative controller. By 1985, the console had completely dominated the market, and third-party developers were willing to sign restrictive exclusivity agreements just to get their games on the system. With runaway success in Japan and a library of exclusive hit titles such as *Super Mario Bros.*, Nintendo geared up to release the system worldwide, which would kickstart a new era of console gaming.

The Famicom's hardwired controllers had a cable length of only 30 inches.



The Famicom's second controller featured a built-in microphone in lieu of Start and Select buttons, though few games used it.

Famicom Disk System

Nintendo produced various add-ons for the Famicom that were exclusive to Japan, including a modem, 3D glasses, and a keyboard attachment for programming in BASIC. Another exclusive attachment was the Disk System, which made games available on rewritable, proprietary floppy disks. This allowed for game saving in titles such as *Metroid* and *The Legend of Zelda* or for buying inexpensive games through disk-writing kiosks. Players bought a blank disk that could be inserted into the kiosk and, for a small fee, would get a complete game written onto it.

The Disk System featured enhanced sound hardware, and disk games such as *The Legend of Zelda* had different soundtracks compared to their international cartridge versions.

The Twin Famicom line was released in both red and black case colors.

Sharp Twin Famicom

Sharp, the Japanese electronics company, had worked with Nintendo since the 1960s as a components supplier. That relationship expanded into hardware licensee in the 1980s, when Sharp produced a few unique model variants of the Famicom. One was a Sharp television with a Famicom built in, while the Twin Famicom line combined the Famicom Disk System and console into a single unit.

Casio PV-1000

1983

Launch price: ¥14,800	**Systems sold:** 5,000–10,000 (est.)
Processor: NEC D780C-1 at 3.58 MHz	**RAM:** 2 KB
Colors: 8	**Games released:** 13–15

The PV-1000 was the first home console from Casio, a Japanese electronics company known for producing calculators, watches, and dedicated LCD handheld games. Released exclusively in Japan, the PV-1000 was another console based on a clone of the Zilog Z80 processor (the SG-1000 and Super Cassette Vision were also Z80-based) but actually had worse performance compared to other systems. The graphics and sound quality of the PV-1000 were more akin to a second-generation console, with few colors and harsh, grating music. The PV-1000 sold poorly, and Casio discontinued the system mere months after its release.

The Casio PV-1000 launched alongside the PV-2000, an 8-bit computer that wasn't cartridge compatible.

G880A
D780C-1
D4016C
MS1034
MS1035
HD74LS74
HD74LS163
HD74LS05
2SC945
AN604C
1000µF35WV

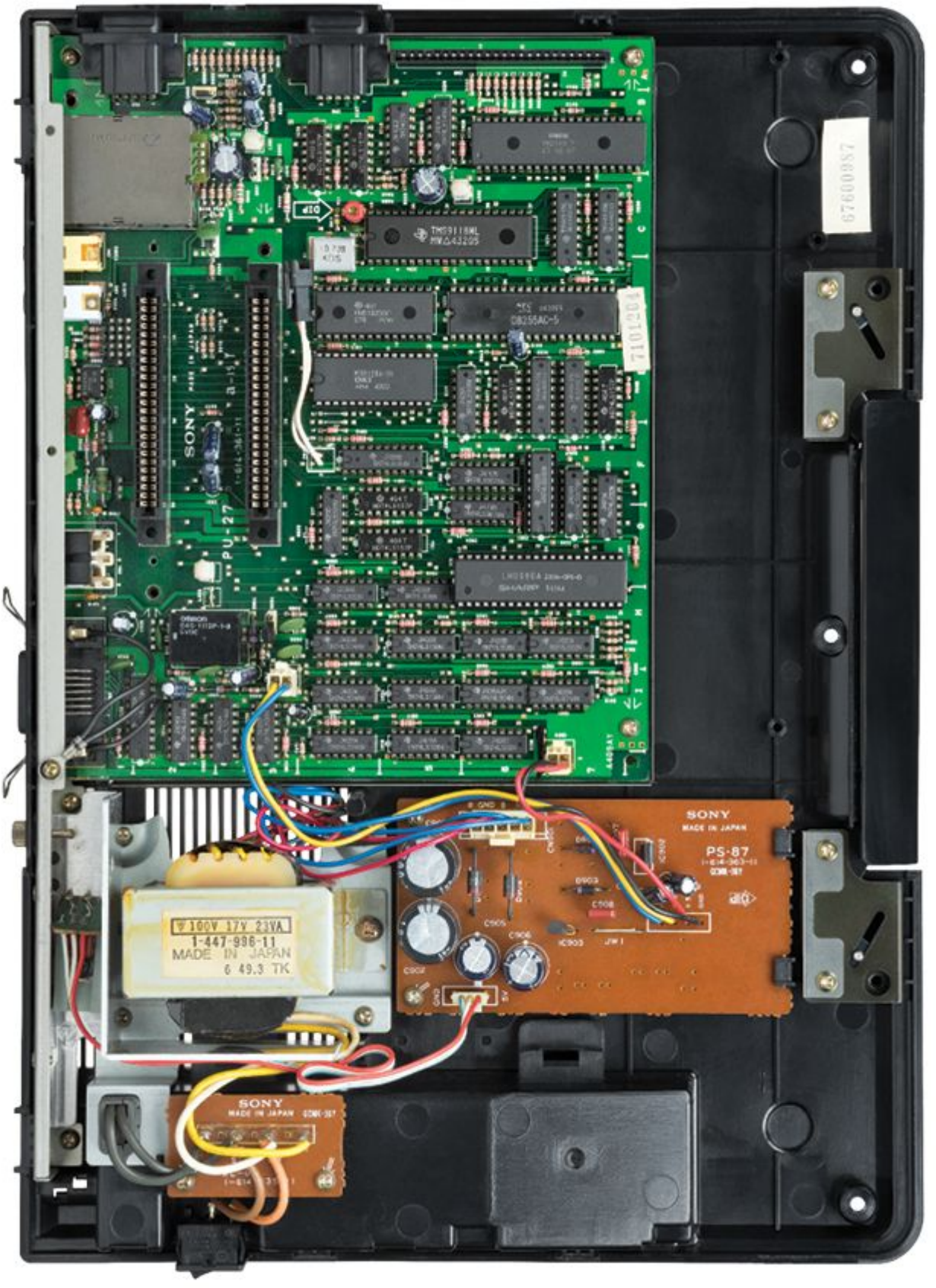
MSX

1983

Launch price: ¥55,000–¥75,000	**Systems sold:** 5 million (all models)
Processor: Zilog Z80A at 3.58 MHz	**RAM:** 8 KB min. **VRAM:** 16 KB min.
Colors: 16	**Games released:** 1,000+

MSX was a computer standard developed by Microsoft and ASCII that was primarily popular in Asia and South America. Built on Microsoft BASIC and standardized hardware, different MSX computers were available from over a dozen electronics manufacturers. While computers were software compatible with each other, manufacturers differentiated themselves with added features such as LaserDisc or MIDI interfaces. MSX was most popular in Japan, where studios such as Konami and Hudson Soft produced original games for the platform. The 8-bit MSX standard was updated throughout the 1980s, but it was eventually overtaken by modern 16-bit computers and the IBM PC standard.

Sony was just one of the companies that manufactured MSX computers; others included Sanyo, Toshiba, Casio, Canon, Panasonic, and Yamaha.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MADE IN JAPAN

Game Pocket Computer

1984

Launch price: ¥12,000	**Systems sold:** 15,000–30,000 (est.)
Processor: NEC D78C06 at 6 MHz	**RAM:** 2 KB
Colors: 2 (black and white)	**Games released:** 5

The Game Pocket Computer was the first true handheld console and was released by Epoch exclusively in Japan in 1984. Unlike the Microvision or Super Micro systems that placed their processors in their game cartridges, the Game Pocket Computer had a built-in microprocessor and ran game code from interchangeable ROM carts. The system featured a black-and-white, 75-by-64-pixel LCD screen, which provided more fidelity and more dynamic games than previous handhelds. However, Epoch's Game Pocket Computer failed to catch on with Japanese gamers, and the handheld was discontinued after releasing only five games.

The Epoch Game Pocket Computer came with a sliding tile puzzle game and a paint program built into the system.

Super Cassette Vision

1984

Launch price: ¥14,800	**Systems sold:** 200,000–300,000 (est.)
Processor: NEC D7801G at 3.58 MHz	**RAM:** 128 bytes **VRAM:** 4 KB
Colors: 16	**Games released:** 30

The Super Cassette Vision was the follow-up to the Cassette Vision, a successful 1981 console by Epoch that had been quickly eclipsed by a new wave of third-generation systems in Japan. The new "super" console was updated with a microprocessor-based design that brought it to parity with other systems. However, despite exclusive games based on popular anime series such as *Doraemon* and *Lupin the 3rd*, the Super Cassette Vision fizzled out in the crowded Japanese market. By 1987, Epoch had quit the home console industry to focus on producing games for other systems.

The console also had a small release in France, where it was rebranded as the Yeno Super Cassette Vision.

Super Micro

1984

Launch price: $59 (with game and LightPak)	**Systems sold:** 5,000–7,000 (est.)
Processor: Unknown	**RAM:** Unknown
Colors: 2 (black and white)	**Games released:** 3

The Super Micro was a handheld gaming console from Palmtex, a California-based game distributor that had early success with importing Nintendo Game & Watch systems in 1982. Soon after, Palmtex began work on its own handheld. Development of the system started as the 1983 crash was underway, which caused a dire financial situation for Palmtex as video game sales declined. Short of investor interest and funds, the Super Micro limped out the gate with little advertising to a depressed market. With only a few thousand units sold, the Super Micro is a rare console for modern collectors, though be aware most units now suffer from hardware failure.

Like the Microvision, the game cartridges housed the handheld's processor and screen overlays.

RDI Halcyon

1985

Launch price: $2,195	**Systems sold:** Never released
Processor: Zilog Z80	**RAM:** Unknown
Colors: Unknown	**Games completed:** 2

The RDI Halcyon was an unreleased game console that was the brainchild of Rick Dyer, a zealous inventor and game maker. Dyer wanted to create a lushly animated and epic fantasy game called *Shadoan*, but first he created a smaller-scale spin-off. That game, *Dragon's Lair*, was a hugely successful LaserDisc-based arcade game that gave Dyer the capital he needed to create his own LaserDisc system that would realize his full-length *Shadoan* game. The console was incredibly ambitious and expensive to make, and only a few systems were manufactured before bankruptcy shut down Dyer's company just prior to the console's release.

The RDI Halcyon was featured as a prize on the game show *Sale of the Century* in 1985.

Nintendo Entertainment System 1985

Launch price: $139–$179 (with R.O.B. & Zapper)	**Systems sold:** 61+ million (includes Famicom)
Processor: Custom Ricoh 2A03 at 1.79 MHz	**RAM:** 2 KB **VRAM:** 2 KB
Colors: 54	**Games released:** 700+

The Nintendo Entertainment System (NES) was a remodeled Famicom that Nintendo brought to the United States in late 1985. The console entered a dormant market that still hadn't recovered following the 1983 crash, but the NES quickly established itself through fun and unique games. With incredibly strong first-party titles, a large library of exclusive third-party games, and highly marketable mascot characters, Nintendo's system created a phenomenon that revived the industry. The NES sold more than 30 million systems in America alone and brought the console market to new highs that established Nintendo and Japan as the new leaders of gaming.

Nintendo's iconic controller was quickly copied by competitors and marked the end of the joystick era.

R.O.B.

Retailers were still cautious toward video games when Nintendo brought its game console to North America. To help alleviate retailer's fears, Nintendo's early promotion for the NES heavily revolved around R.O.B. (Robotic Operating Buddy), a motorized robot accessory meant to entice children and present the game system as a toy. It wasn't until Nintendo test-marketed the NES that it proved to retailers that the console would sell and that video games were still a viable market. As the NES took off, R.O.B. became more and more unnecessary, and by 1988, the robot toy had been phased out altogether.

Only two games were made that used R.O.B.: *Gyromite* and *Stack-Up*.

In the US, many NES consoles came with the Zapper light gun and the game *Duck Hunt*. The Zapper would later change color to orange in 1988 to accommodate new laws regulating the appearance of toy guns.

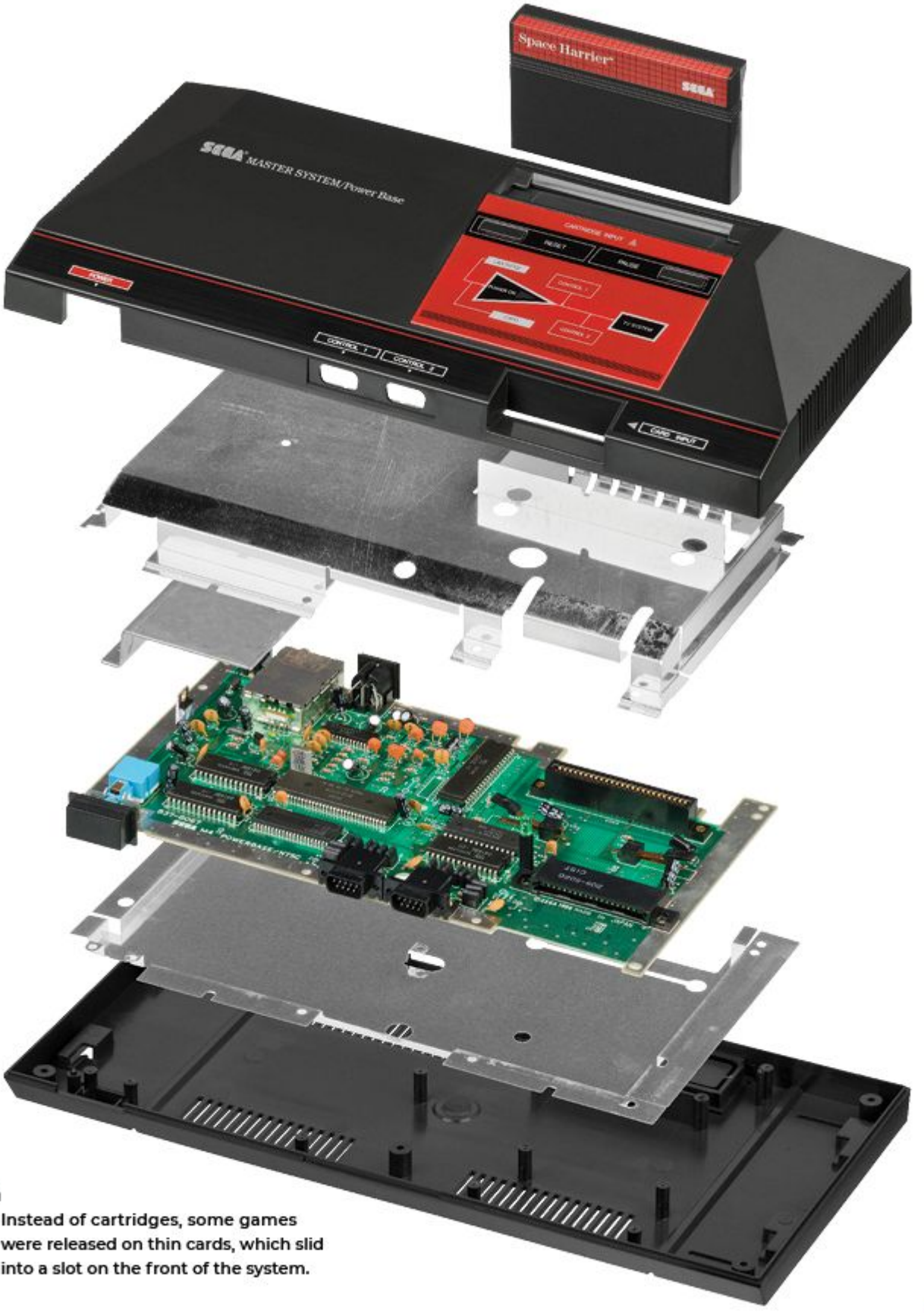
Sega Master System

1986

Launch price: $129	**Systems sold:** 20+ million
Processor: NEC 780C at 3.58 MHz	**RAM:** 8 KB **VRAM:** 16 KB
Colors: 64	**Games released:** 340+

The Master System was Sega's remodeled and enhanced rerelease of the SG-1000 console for the worldwide market. Now with more RAM and an upgraded video processor, the Master System offered better graphics than its main rival, the NES/Famicom. Though it was technically superior and offered a competitive game library with exclusive Sega titles, the Master System couldn't break into the Nintendo-dominated North American and Japanese markets. However, the console took off in Europe and South America (where Nintendo was weak) and outsold the NES to became the generation's console leader in those parts of the world.

The Master System was based off the Japanese Sega Mark III, Sega's third revision of the SG-1000 console.



Instead of cartridges, some games were released on thin cards, which slid into a slot on the front of the system.

Atari 7800

1986

Launch price: $79	**Systems sold:** 3.5+ million
Processor: Custom MOS 6502C at 1.79 MHz	**RAM:** 4 KB
Colors: 256	**Games released:** 58

The 7800 was Atari's third console and was originally meant for release in 1984 as a hurried successor to the troubled 5200. However, new management at Atari and other issues shelved the completed 7800, and the system wouldn't see a release until mid-1986. When it did launch, Atari was unprepared to compete with Nintendo, and the 7800 struggled to attract new gamers with its small game library filled with rehashed arcade ports. Ultimately, poor support from a weakened Atari, a lack of third-party titles, and the extreme popularity of the NES pushed the Atari 7800 to a distant second place in North America.

The 7800 was able to play Atari 2600 games without an adapter, which made it the first console to offer native backward compatibility.

The 7800 used a new custom MARIA chip for graphics, but shared the same sound chip as the Atari 2600.

Atari XE Game System

1987

Launch price: $159	**Systems sold:** 80,000–100,000 (est.)
Processor: Custom 6502C at 1.79 MHz	**RAM:** 64 KB **VRAM:** 16 KB
Colors: 256	**Games released:** 32

The Atari XE Game System (XEGS) was a repackaged and consolized version of Atari's 65XE computer, itself an updated model of the 1978 Atari 800. Unlike the Atari 5200 (also based on the Atari 8-bit computer line), the XEGS was directly compatible with many Atari computer games and peripherals. However, few unique games were developed for the system, as most of the XEGS's library was relabeled, older game stock. With stale games, little advertising, and waning interest in 8-bit computers, the XEGS was another misstep for Atari. Official support dried up quickly, and remaining stock was liquidated a year or two after its release.

The Atari XEGS came with the built-in game *Missile Command*.

The Mirai mockup is currently in the collection of the National Videogame Museum in Frisco, Texas.

Atari Mirai

The Atari Mirai is a mysterious case mockup that fell into the hands of a private collector following Atari's demise. Little is known about the system other than it was created in the late 1980s and used the same design scheme as the Atari XE Game System. Most theories for its purpose revolve around the Mirai's massive cartridge slot, with speculation that it was a collaboration with the Japanese arcade company SNK to bring its Neo Geo MVS system to the American home market.

LJN Video Art

1987

Launch price: $99	**Systems sold:** 50,000–70,000 (est.)
Processor: Motorola 6805	**RAM:** 16 KB
Colors: 16	**Games released:** 9

LJN was a toy company and software developer that made products based on popular movie, wrestling, and comic franchises in the 1980s and early 1990s. Its first and only foray into video game hardware was the Video Art, a console for children that focused on digital coloring. Users drew onscreen with the joystick, picking from 1 of 16 different colors. Other cartridges were available that functioned as digital coloring books, with themes ranging from dolls and animals to licensed characters from Disney, Looney Tunes, and Marvel. There was no interactivity other than coloring these pages, making the system very limited in scope.

Drawing onscreen with the Video Art's joystick was very difficult, which led to mostly negative reviews of the console.

CTL-1500-36LR

Action Max

1987

Launch price: $69	**Systems sold:** 60,000–80,000 (est.)
Processor: Unknown	**RAM:** Unknown
Colors: None, relied on prerecorded VHS video	**Games released:** 5

The Action Max was a light gun–based quasi console created by the American toy-maker Worlds of Wonder. The system did not run or play games itself, but it instead worked in conjunction with a VCR that played prerecorded VHS movies made of on-rail, light-gun shooting segments. The Action Max only registered whether a shot hit or missed and would display a player's score. This setup was incredibly limited, as onscreen gameplay never varied, no matter how well or poorly the player performed. The Action Max was on the market only briefly before Worlds of Wonder declared bankruptcy, which effectively ended the console and sent it to the clearance shelf.

The red Score Signal receiver attached to the TV screen via a suction cup and would flash when a target was hit.

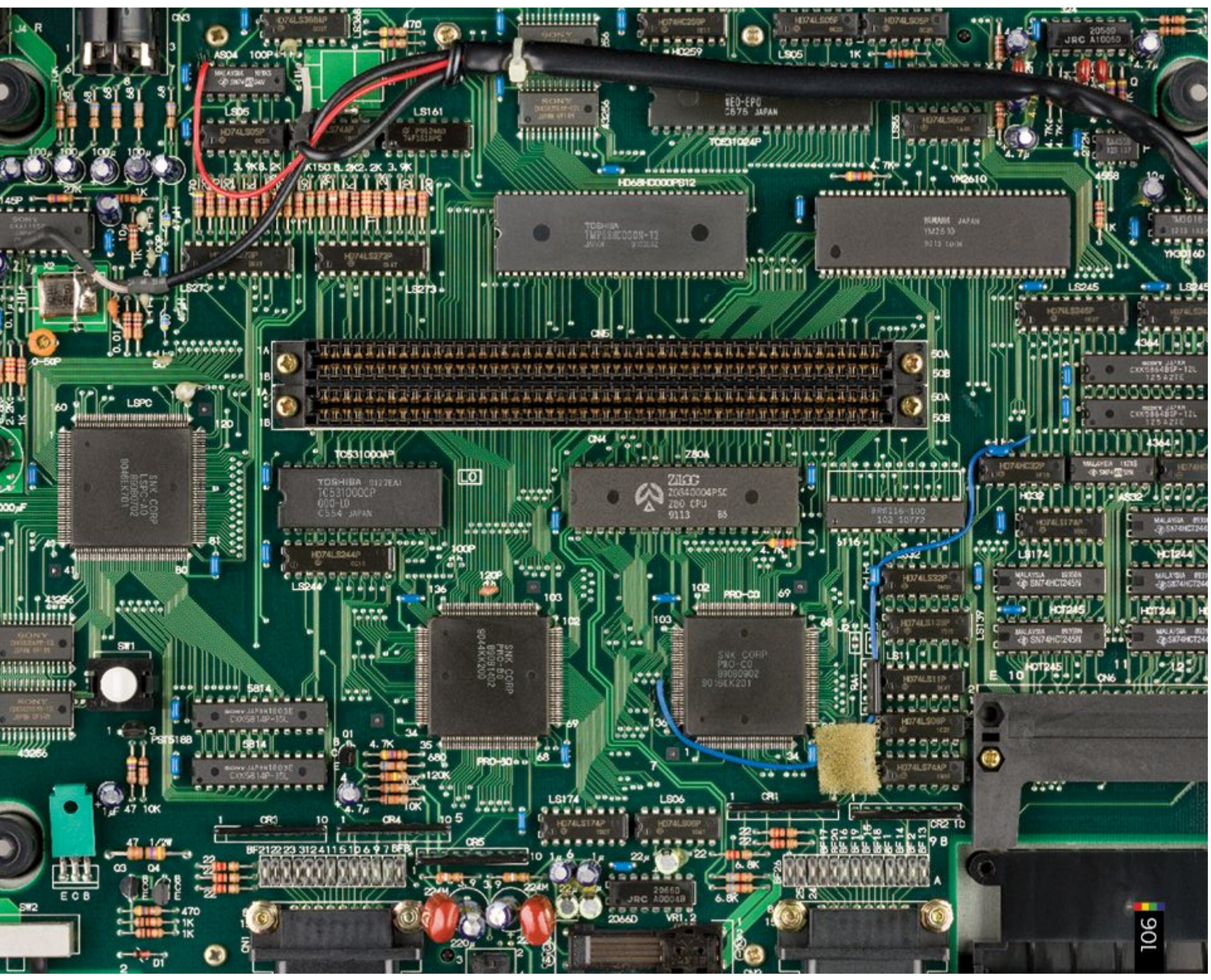
VTech Socrates

1988

Launch price: $129	**Systems sold:** 70,000–100,000 (est.)
Processor: Zilog Z80	**RAM:** 64 KB
Colors: 256	**Games released:** 8

The Socrates was an edutainment console from VTech, a company then known for its electronic learning products. While VTech's other educational devices were inexpensive faux computers, the Socrates was more like a gaming console and had a small library of learning games that taught spelling, math, and basic logic. At launch, the system was more expensive than consoles from Nintendo, Sega, and Atari, and it suffered from slowdown that caused long pauses between actions. Sales of the system were below VTech's expectations, but the Socrates lingered on the market for the next few years before being phased out by the mid-1990s.

Optional accessories for the Socrates included a touch tablet, a mouse, and a speech synthesis cartridge.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YAMAHA JAPAN
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SNK CORP
PRO-C1
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Fourth Generation

Game consoles moved to 16-bit processors in the fourth generation, as new systems with more colorful and detailed 2D sprite graphics battled it out. In the United States, Nintendo's dominance of the market was challenged by Sega, whose Genesis system became a best seller thanks to a highly effective advertising campaign and a string of exclusive hit games. Other systems did not fare as well: NEC's TurboGrafx-16 failed to connect with American audiences, and a wave of expensive multimedia systems such as the Philips CD-i and Commodore CDTV sold poorly. Additionally, the fourth generation saw the emergence of multiple handheld consoles, with Nintendo's simple, monochrome Game Boy beating out high-end color systems from Atari and Sega to become the platform leader.

Sega Mega Drive motherboard (above), Neo Geo AES motherboard (opposite)

NEC PC Engine

1987

Launch price: ¥24,800	**Systems sold:** 8+ million
Processor: Hu6280 at 1.79 or 7.16 MHz	**RAM:** 8 KB **VRAM:** 64 KB
Colors: 512	**Games released:** 660+

The fourth generation of game consoles began with the PC Engine, the first home gaming console to use 16-bit graphics. With an 8-bit CPU, it was not a true 16-bit system, but its colorful, lush visuals were an improvement over older 8-bit consoles. The PC Engine was developed through a partnership between the electronics giant NEC and the video game developer Hudson Soft. With popular and exclusive games from Hudson Soft and ports of arcade titles that older systems couldn't handle, the tiny PC Engine built a sizable following in Japan, becoming the country's second best-selling console of this era.

The PC Engine didn't use standard game cartridges but instead played games from slim data cards.

PC Engine Variant Models

NEC released a staggering amount of PC Engine variants during its lifetime. The original base design spawned two alt models (the gray Core Grafx series seen above), which featured minor board changes and the addition of a multi-A/V out port. Other variants included a fully portable handheld, a semiportable unit with a built-in screen, the UFO-shaped Shuttle, a dockable PAC version for the Pioneer LaserActive, a model built into a Sharp X1 computer, and even a high-end model with extra graphics hardware, the SuperGrafx (page 305). Finally, the Duo series combined the PC Engine's optional CD-ROM drive into a single unit.

Sega Mega Drive

1988

Launch price: ¥21,000	**Systems sold:** 30+ million (worldwide)
Processor: Motorola 68000 at 7.6 MHz	**RAM:** 64 KB (68000), 8 KB (Z80) **VRAM:** 64 KB
Colors: 512	**Games released:** 900+ (worldwide)

The Mega Drive was Sega's follow-up to its 8-bit SG-1000 and Master System console line. The Mega Drive's hardware was similar to Sega's System 16 arcade boards, utilizing a 16-bit Motorola 68000 for its main CPU and a Zilog Z80 to handle sound. In Japan, the Mega Drive struggled against Nintendo and NEC's new PC Engine, a console that became the preferred 16-bit system for arcade and action games. In Europe, where the Mega Drive launched in 1990, Sega continued its domination of the market, thanks to strong support from Western developers.

Sega's 16-bit system was named the Genesis in North America, but most of the world knew it as the Mega Drive.

The European Mega Drive (above) differed only cosmetically from the Japanese Mega Drive (opposite).

Nintendo Game Boy

1989

Launch price: $89	**Systems sold:** 115+ million (all models)
Processor: Sharp LR35902 at 4.19 MHz	**RAM:** 8 KB **VRAM:** 8 KB
Colors: 4 (monochrome)	**Games released:** 1,000+ (all models)

The Game Boy was Nintendo's first handheld console with interchangeable games. Created around strict requirements for cost and power consumption, the Game Boy was a marvel of modest engineering. The system's older processor and olive-colored monochrome screen paled in comparison to the high-end, full-color handhelds from Sega and Atari, but it cost much less and had four times the battery life. Backed by hit Nintendo games and a large library of third-party titles, the Game Boy came to dominate the handheld gaming market for more than a decade. With worldwide sales of over 115 million systems, it remains one of the best-selling consoles of all time.

The Game Boy could run for about 15 to 20 hours on four AA batteries.

Nintendo GAME BOY
SELECT
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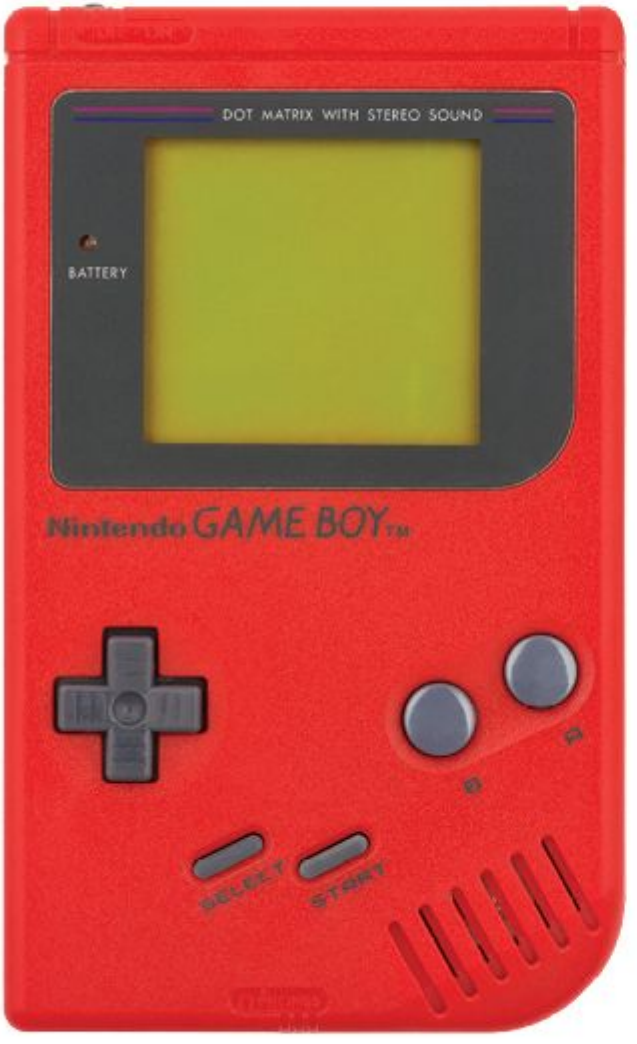
Game Boy Pocket

The Game Boy Pocket was an updated Game Boy that was considerably smaller and could play games for over 10 hours with just two AAA batteries. Released in 1996, the Pocket came at a time when other systems would have released a successor, but the limitations of current LCD technology (plus the Game Boy's complete dominance of the handheld market) led Nintendo to stay with the Game Boy's cheap and simple design for a few more years.

In 1995 Nintendo released five new Game Boy case colors: black, red, yellow, green, and clear.



The Game Boy Camera's built-in software had minigames and photo editing capabilities, and it could even create short animated movies.

Game Boy Camera and Printer

The Game Boy Camera, released in 1998, was an official accessory that allowed you to take digital photos with your Game Boy. Created when digital imaging was in its infancy, the Game Boy Camera was only capable of taking low-resolution black-and-white photos. The camera could also be paired with an optional thermal printer, which allowed photos to be printed and made into stickers.

Sega Genesis

1989

Launch price: $189	**Systems sold:** 30+ million (worldwide)
Processor: Motorola 68000 at 7.6 MHz	**RAM:** 64 KB (68000), 8 KB (Z80) **VRAM:** 64 KB
Colors: 512	**Games released:** 900+ (worldwide)

The Genesis was a rebranded Mega Drive console for the North American market. After the failure of the Master System in the Nintendo-dominated United States, Sega poured its resources into an edgy and aggressive marketing campaign for the Genesis, using ads to directly attack and ridicule Nintendo. The edgy and abrasive ads, combined with exclusive sports and action games (such as *Sonic the Hedgehog*), led the Sega Genesis to incredible success. The console sold over 20 million consoles in the United States alone, ending Nintendo's undisputed reign and becoming the best-selling system of all time for Sega.

The Genesis originally included the pack-in game *Altered Beast*.

The Genesis controller was natively compatible with the Atari 2600.

Sega CD

Released in the United States in 1992, the Sega CD was a CD add-on for the Genesis. The drive added an extra Motorola 68000 processor, support for CD-quality sound, and the ability to play full-motion video (FMV). However, due to the console's limited ability to simultaneously display different colors, the FMV often appeared grainy, small, and low quality. Despite the popularity of the Genesis, the Sega CD never achieved major success due to its high cost ($299 at launch) and the poor reception to many of its FMV-based games.

The first tray-loading Sega CD model was replaced by a newer design in less than a year.

The top-loading model 2 Sega CD's release in 1993 coincided with the new, sleeker model 2 Genesis.

The 32X launched at $159 and sold for as little as $19 after it was discontinued.

Following the 32X's failure, Sega scrapped plans for an all-in-one Genesis/32X console, the Neptune, shown here as a prototype.

Sega 32X

The 32X was a Genesis add-on released in late 1994 that was intended to extend the life of the 16-bit Genesis as the industry transitioned to 32-bit systems. Based on twin 32-bit processors, the 32X provided enhanced graphics and 3D capability for less than the cost of a newer system.

Though the 32X had strong initial sales and hype, its rushed release resulted in underwhelming games that led to a steep sales decline. After third-party support dried up, Sega dropped the 32X in early 1996 to focus on its new Saturn console.

NEC TurboGrafx-16

1989

Launch price: $199	**Systems sold:** 600,000+
Processor: Hu6280 at 1.79 or 7.16 MHz	**RAM:** 8 KB **VRAM:** 64 KB
Colors: 512	**Games released:** 135+ (North America only)

The TurboGrafx-16 was a rebranded and redesigned PC Engine that NEC released for the American market. At launch, the console faced off against the established NES and the newly released Sega Genesis. NEC's American division was ill-suited to handle the stiff competition, and after low initial sales, NEC of Japan drastically cut funding for American operations. The move crippled the TurboGrafx-16, which was forced to endure with barebones support for the rest of its life. With little advertising, few third-party titles, and many of its best games stuck unlocalized in Japan, the TurboGrafx-16 would end up a distant third to Sega's and Nintendo's consoles.

Only one controller port meant users had to buy a separate adapter for multiplayer games.

The TurboGrafx-16 was much larger than the PC Engine due to NEC's worries that Americans wouldn't like a small game console.

TurboGrafx-CD and TurboDuo

The TurboGrafx-16 was the first American console that could play CD games when paired with an optional CD drive. However, the add-on's high price—$399 when it launched in 1990—led to low sales. In late 1992, a streamlined, all-in-one version called the TurboDuo was released for just $299. However, the new system did little to help with the TurboGrafx-16's mild reception, and NEC phased out US support in 1994.

The TurboGrafx-16's detachable CD drive could be used as a portable music player.

The TurboDuo is a rare and expensive collector's item, but many systems need repair due to failed or leaking capacitors.

The TurboExpress is another system that suffers today from bad or failing capacitors.

TurboExpress

The TurboExpress was a fully portable TurboGrafx-16 released in 1990 for $249. Compared to the Lynx and Game Boy, the TurboExpress was a luxury handheld that offered console gaming on the go. That power came at the cost of battery life, and the TurboExpress only could play games for up to three hours with six AA batteries. A TV tuner that picked up over-the-air broadcasts was available separately.

Atari Lynx

1989

Launch price: $179	**Systems sold:** 2 million (est.)
Processors: Custom "Mikey" and "Suzy"	**RAM:** 64 KB
Colors: 4,096	**Games released:** 71+

The Atari Lynx was a powerful handheld system that featured a full-color, backlit screen. Compared to Nintendo's simple, monochrome Game Boy, the Atari Lynx was an upscale portable that offered a home-console experience on the go. However, the Lynx's backlit screen rapidly consumed batteries, and like other post-crash Atari systems, the Lynx suffered from poor advertising, limited retail presence, little third-party support, and long game droughts. The Lynx quickly fell behind the Game Boy in sales and was later replaced by the Sega Game Gear as the preferred color handheld console, shunting the Lynx to a distant third place.

The Lynx could run for about 3 to 5 hours off of six AA batteries.

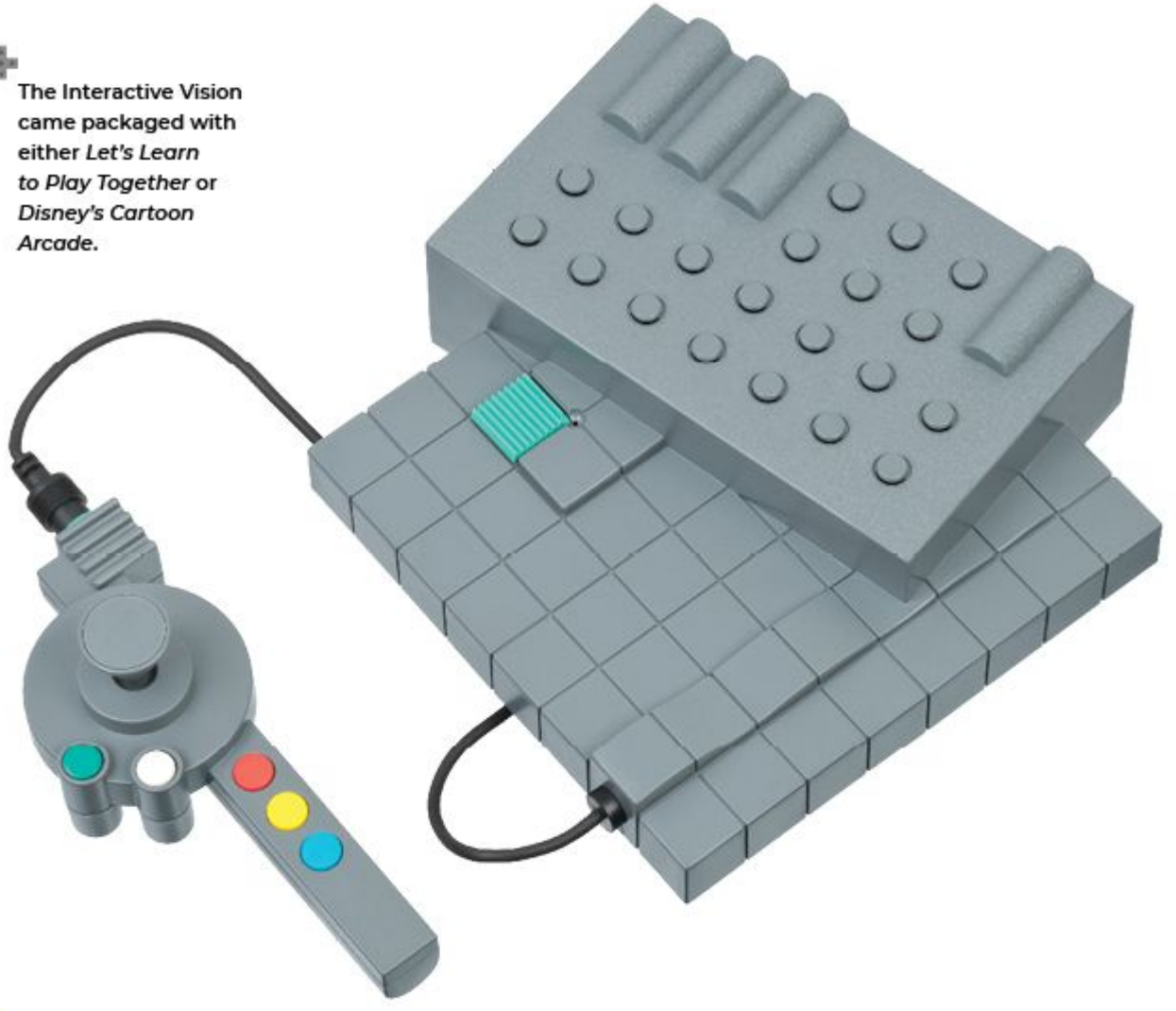
In 1991, Atari released an updated Lynx with a smaller body and other minor improvements.

Interactive Vision

1989

Launch price: $120	**Systems sold:** 80,000–110,000 (est.)
Processor: VMI8802 (Intel based)	**RAM:** 16 KB
Colors: 16 (overlayed on VHS video)	**Games released:** 7

The View-Master Interactive Vision was a VHS-based edutainment console designed for young children. The Interactive Vision worked in conjunction with a VCR and offered limited interactivity with a small library of VHS games. The system overlaid simple graphics over a VHS tape as it played, offering either story choices or brief action games, and gave the illusion of different outcomes by switching between one of two audio tracks encoded on the tape. Ultimately, the Interactive Vision's high price relative to consoles like the NES and its limited replayability led to the system being discontinued within a year.



The Interactive Vision came packaged with either *Let's Learn to Play Together* or *Disney's Cartoon Arcade*.

Gamate

1990

Launch price: $69	**Systems sold:** Unknown
Processor: NCR 65CX02 at 2.22 MHz	**RAM:** 1 KB **VRAM:** 8 KB
Colors: 4 (monochrome)	**Games released:** 50–60

The Gamate was a handheld game console developed by the Taiwanese company Bit Corporation. The system was the first in a series of low-cost Game Boy knockoffs that came out of East Asia in the early '90s, each of which had its own game library of clones of other system's popular titles. While the Gamate was offered worldwide (in the United States it was through the mail-order company Alston Information Research), its actual impact was limited and short lived. The Gamate, like the other Game Boy knockoffs, was dumped on the market with little advertising or support and disappeared a few years after its release.

Like the PC Engine, the Gamate used thin game cards instead of cartridges.

Neo Geo AES

1990

Launch price: $649	**Systems sold:** 300K–600K (including CD; est.)
Processor: Motorola 68000 at 12 MHz	**RAM:** 64 KB **VRAM:** 84 KB
Colors: 65,536	**Games released:** 150+

In 1989, the Japanese gaming company SNK produced the Multi Video System (MVS), a video arcade platform capable of holding multiple games in a single cabinet through the use of large, interchangeable game cartridges. In 1990, SNK produced the Neo Geo AES, a console version of the MVS designed for the home market. The powerful system brought the quality of arcade gaming to the living room, but that quality came at a high price: its massive game cartridges cost around $200 to $300 each. While expensive, the AES was meant for the enthusiast and rental markets and today is seen as a holy grail for die-hard fans of SNK arcade games.

The Neo Geo AES was the first game console to feature a memory card slot, which used cards capable of holding up to 2 KB of save data.

SNK released multiple Neo Geo CD models. The last model, the CDZ, featured a double-speed CD drive.

Neo Geo CD

The AES's costly game cartridges kept the console inaccessible to most people, which prompted SNK to release the Neo Geo CD in 1994. Built from the same hardware as the AES, the new console played more affordable CD versions of cartridge games. However, the system's single-speed CD drive and the need to load large amounts of data into the console's RAM resulted in long loading times, drawing criticism for repetitive 20 to 40 second pauses. The console was also limited to 2D sprites, which suffered in comparison to the 3D graphics of the PlayStation and Saturn. With niche appeal and low sales, the Neo Geo CD would be SNK's last home console.

Sega Game Gear

1990

Launch price: $159	**Systems sold:** 10+ million
Processor: Zilog Z80 at 3.58 MHz	**RAM:** 8 KB **VRAM:** 16 KB
Colors: 4,096	**Games released:** 350+

The Game Gear was a handheld gaming console from Sega that had a full-color, backlit screen. Essentially a portable Master System with more color capability, the Game Gear was Sega's entrance to the burgeoning handheld console market. While the Game Gear was similar to the Atari Lynx in power and design, Sega's console outsold and surpassed the Lynx thanks to better marketing and portable versions of hit games such as *Sonic the Hedgehog*. While it never came close to overtaking the Game Boy and struggled in later years, the Game Gear was the only system that really challenged the Game Boy's market dominance.

The Game Gear's fluorescent tube backlight could consume six AA batteries in only 3 to 5 hours.

Sega also sold an optional TV tuner for the Game Gear that allowed for external video input or TV watching.

Hartung Game Master

1990

Launch price: Unknown	**Systems sold:** Unknown
Processor: NEC D78C11APF	**RAM:** 2 KB
Colors: 2 (black and white)	**Games released:** 18+

The Game Master was a European handheld console that was commonly credited to Hartung, a German toymaker. Often described as a "Game Boy clone," the Game Master more closely resembled the older Epoch Game Pocket Computer, as both shared a similar processor and low-resolution, two-color screens. Whether Hartung actually created the handheld is unknown, but it is more likely the system and its games were developed in Hong Kong and rebranded for various European markets. The Game Master was only around a short while before it was replaced with more advanced handhelds such as the Mega Duck and Watara Supervision.

Game Masters appeared under a variety of colors and branding. In the UK it was the Systema 2000.

Amstrad GX4000

1990

Launch price: £99	**Systems sold:** 15,000
Processor: Zilog Z80A at 4 MHz	**RAM:** 64 KB **VRAM:** 16 KB
Colors: 4,096	**Games released:** 25+

The GX4000 was a European-exclusive game console released by the British electronics company Amstrad. The system was a rebranded and consolized version of an Amstrad CPC, a line of 8-bit computers that were popular in Europe in the 1980s. By the early 1990s, however, these and other 8-bit computers were being succeeded by game consoles and 16-bit computers. Amstrad attempted to revitalize its CPC series with the GX4000 in 1990, but the system failed almost immediately, as it was redundant to CPC owners and console gamers weren't interested. Just months after the system's debut, the GX4000 and the CPC line were discontinued.

The GX4000 was based on the CPC line, which sold about three million computers worldwide.

Super Famicom

1990

Launch price: ¥25,000	**Systems sold:** 41+ million (worldwide)
Processor: Custom 65C816 at 3.58 MHz	**RAM:** 128 KB **VRAM:** 64 KB
Colors: 32,768	**Games released:** 1,700 (worldwide)

The Super Famicom was the 16-bit successor to Nintendo's immensely popular Famicom/NES console. Nintendo's market domination in Japan and America allowed the company to take its time developing the new system, and the Super Famicom came out years after its 16-bit rivals, the Sega Mega Drive and PC Engine. On its release, the Super Famicom had advanced graphic techniques and richer sound than its competitors, and it also launched with the hit game *Super Mario World*. Quality first-party titles, combined with third-party exclusive games series such as *Dragon Quest* and *Final Fantasy*, led Nintendo to dominate the fourth generation in Japan.

While the American Super NES had its own unique look, the rest of the world used the rounded Super Famicom design.

The Super Famicom had the first controller to include shoulder buttons.

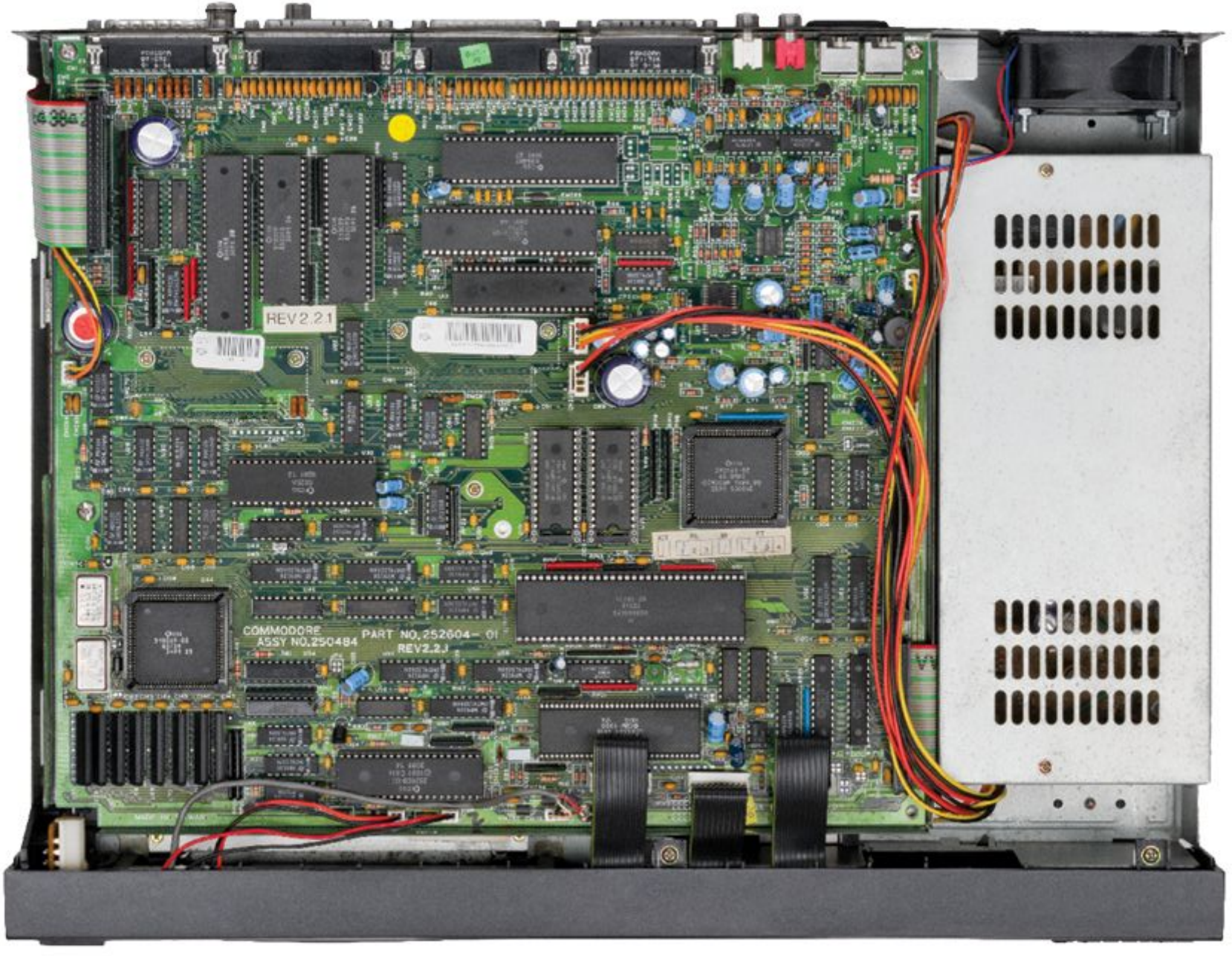
Commodore CDTV

1991

Launch price: $999	**Systems sold:** 25,000–50,000 (est.)
Processor: Motorola 68000 at 7.16 MHz (NTSC)	**RAM:** 1 MB
Colors: 4,096	**Games released:** 2,000+ (mostly Amiga games)

The Commodore CDTV was a repackaged Amiga 500 computer that included a built-in CD drive and was the start of a wave of advanced, CD-based multimedia machines. As the CD format took off, the electronics industry envisioned a device that turned the living room television into a media hub, where families could learn, listen to music, play games, or watch movies. However, the technology was expensive, and most consumers would have rather invested that money into a computer that was far more versatile. The CDTV, with its incredibly high price, failed almost instantly and was an early casualty of the multimedia TV box format.

With an optional keyboard, floppy drive, and mouse, the CDTV could be used as a standard computer.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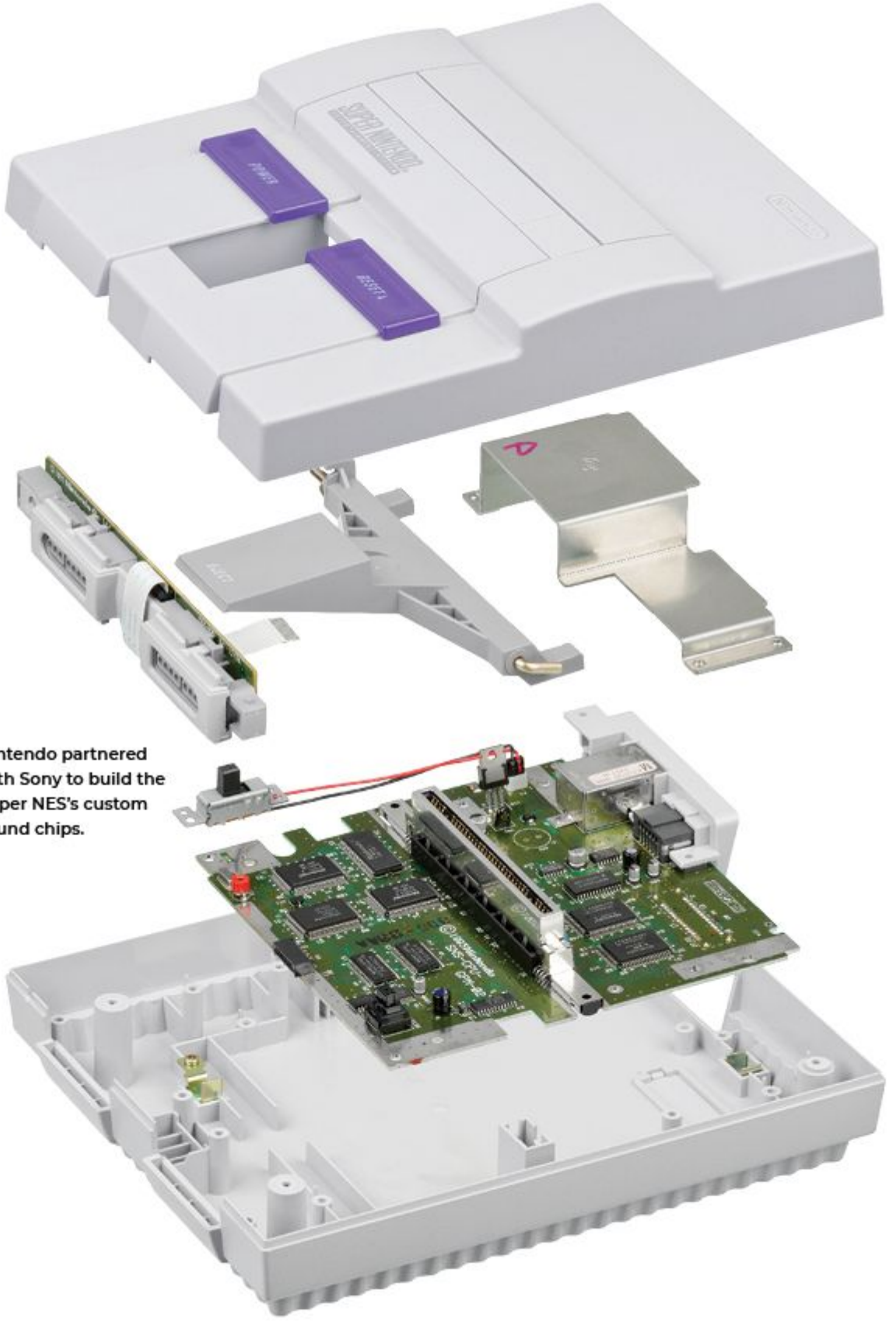
Super NES

1991

Launch price: $199	**Systems sold:** 41+ million (worldwide)
Processor: Custom 65C816 at 3.58 MHz	**RAM:** 128 KB **VRAM:** 64 KB
Colors: 32,768	**Games released:** 1,700 (worldwide)

The Super Nintendo Entertainment System (NES) was what Nintendo's 16-bit Super Famicom was known as in the rest of the world. In America, the Super NES launched as the Sega Genesis rapidly gained ground against Nintendo, which spurred a fierce console war between the two systems. The Super NES sold neck and neck with the Genesis, but it wasn't until the release of the massive hit *Donkey Kong Country* that the Super NES pulled ahead. Nintendo carried that momentum in the Super NES's later years as the Genesis wore down, and it ultimately became the best-selling 16-bit console in the United States by the end of the fourth generation.

Finding a Super NES in its original gray color can be difficult today, as many consoles have yellowed due to the ABS plastic's sensitivity to UV light.



Nintendo partnered with Sony to build the Super NES's custom sound chips.

Philips CD-i

1991

Launch price: $800–$1,000	**Systems sold:** 1+ million (est.)
Processor: Motorola 68070 at 15 MHz	**RAM:** 1 MB
Colors: 16,777,216	**Games released:** 190+

The CD-i was a CD-based hardware standard and multimedia format created by Philips that played on a variety of dedicated machines. The CD-i platform was designed to be a media hub that allowed users to play games, watch digital videos, listen to music, or use educational software on their TVs. Unfortunately, the machines were too expensive, the games were not fun, video CDs failed to catch on, and people preferred to use stereos and computers for music and software. The CD-i is most well known today for its bad *Zelda* and *Mario* games, an unexpected result of a failed partnership between Nintendo and Philips to bring a CD add-on to the Super NES.

The CD-i's optional MPEG digital video cartridge was necessary for playing video CDs and most FMV games.

The massive 910 model was the first CD-i player released.

The 450 was a later CD-i model that looked more like a game console.

CD-i Models and Variants

Philips and manufacturing partners such as Sony and Goldstar produced a variety of CD-i models, including portable units, heavy-duty business systems, and even a TV with a built-in player. Philips attempted to make the CD-i the standard multimedia format for consumer and professional environments, but adoption rates were low. Despite the early-'90s hype for multimedia TV machines, the systems were a massive flop, and heavy losses from poor sales led Philips to abandon the CD-i format in 1996.

Memorex VIS

1992

Launch price: $699	**Systems sold:** 10,000–15,000 (est.)
Processor: Intel 286 at 12 MHz	**RAM:** 1 MB
Colors: 16,777,216	**Games released:** 60+

The Memorex Video Information System (VIS) was a CD-based multimedia device created by the Tandy Corporation and sold exclusively through the American electronics retailer RadioShack. Based off a modified version of Windows 3.1, the VIS was a stripped-down x86 computer designed for a television. Its software library consisted mostly of educational titles for children and a few ports of DOS games such as *Sherlock Holmes, Consulting Detective*. The system, which was seen as expensive, limited, and not very fun, was a sales disaster for Tandy, who ended support for the VIS in 1994 and sold its remaining stock to a liquidation company.

Less than two years after its debut, the VIS could be bought for $99 in a bundle that came with 20 software titles.

Watara Supervision

1992

Launch price: $49	**Systems sold:** Unknown
Processor: WDC 65C02 at 4 MHz	**RAM:** 8 KB **VRAM:** 8 KB
Colors: 4 (monochrome)	**Games released:** 60+

The Watara Supervision was one of a handful of Nintendo Game Boy clones that came out of East Asia in the early 1990s. Developed in Hong Kong and released worldwide under a variety of distributors and names, the Supervision attempted to undercut the Game Boy by offering a similar experience for less money. However, the handheld had little advertising and relied on local—rather than national—retail distribution, which meant few were even aware of the system. With almost no third-party support and a game library composed of underwhelming clones of popular titles, the Supervision eventually disappeared from the market.

Most Supervisions came with a tilting screen, though a Game Boy brick-style model was also available.

Mega Duck

1993

Launch price: €60 (approx.)	**Systems sold:** Unknown
Processor: LR35902/Z80 at 4.19 MHz	**RAM:** 8 KB **VRAM:** 8 KB
Colors: 4 (monochrome)	**Games released:** 45

The Mega Duck was a handheld console developed by the Hong Kong electronics company Welback Holdings and was distributed by multiple companies throughout Europe and South America. The system was yet another Game Boy knockoff like the Watara Supervision, though the Mega Duck was almost a complete match of the Game Boy in terms of specs. Games for the Mega Duck were mostly clones of popular games, and its library of around two dozen titles was created by Taiwanese developers. System sales were likely low, and like the Supervision, Game Master, and Gamate, the Mega Duck and its games can be difficult to find and play today.

In South America, the Mega Duck was sold under the Cougar Boy branding.

Pioneer LaserActive

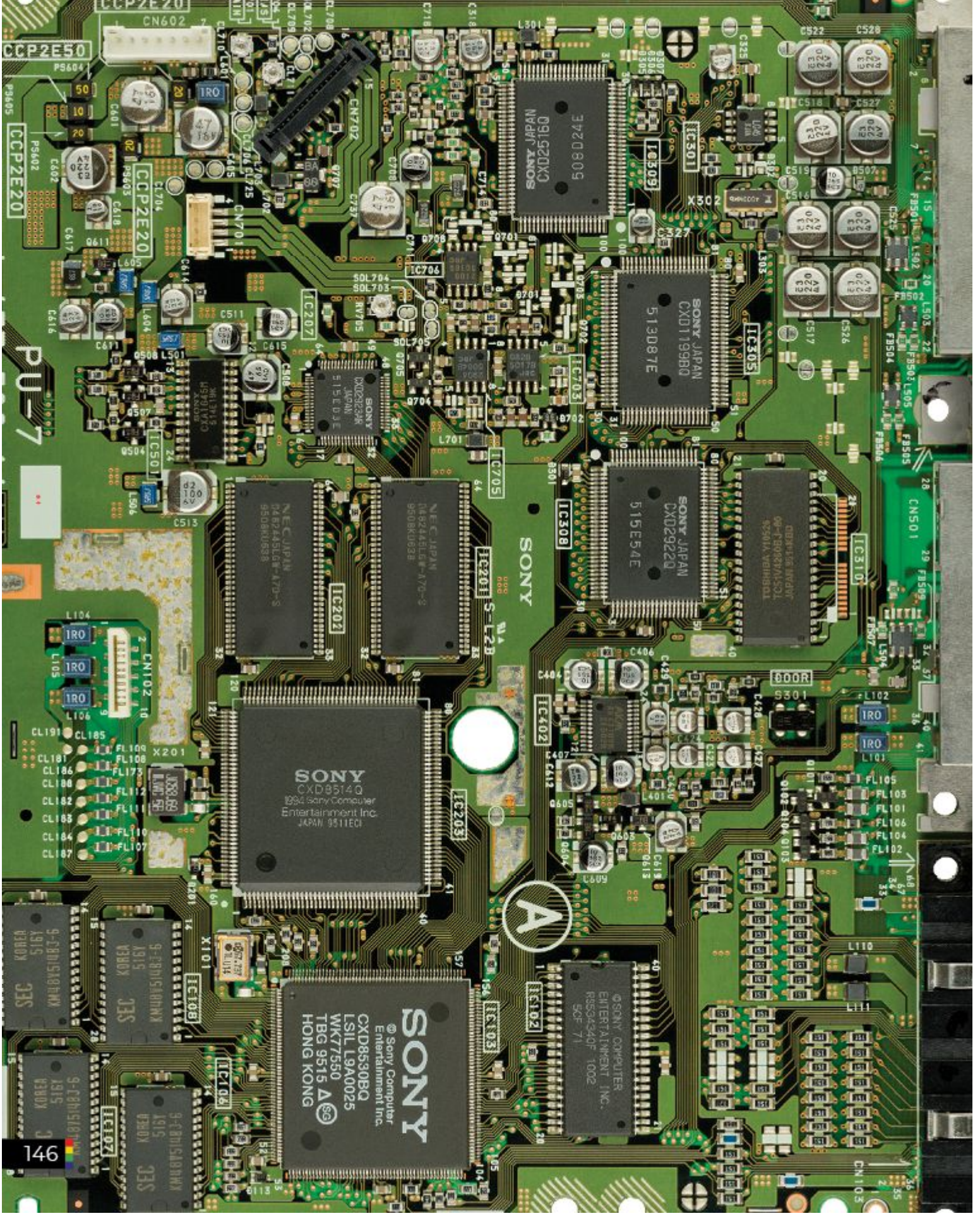
1993

Launch price: $970 (base LaserDisc player only)	**Systems sold:** 40,000 (LaserDisc player only)
Processor: 68000 (Genesis), Hu6280 (TG-16)	**RAM:** 64 KB (Genesis), 8 KB (TurboGrafx-16)
Colors: 512 (can be overlayed on LaserDisc video)	**Number of LaserDisc games:** 31

The LaserActive was a CD and LaserDisc player that also had the unique ability to become a game console when paired with an optional PAC expansion. With either a TurboGrafx-16 or Sega Genesis expansion installed, the LaserActive could play regular console games, CD games, and even a small library of exclusive LaserDisc games.

The LaserActive was an ambitious attempt to create a universal media machine, but it was also prohibitively expensive—a fully kitted system cost well over $2,000—and thus sold poorly. With low sales and little consumer interest, Pioneer abandoned the LaserActive format and left the video game market to focus on general electronics.

Most LaserActive PAC expansions no longer work due to leaking capacitors.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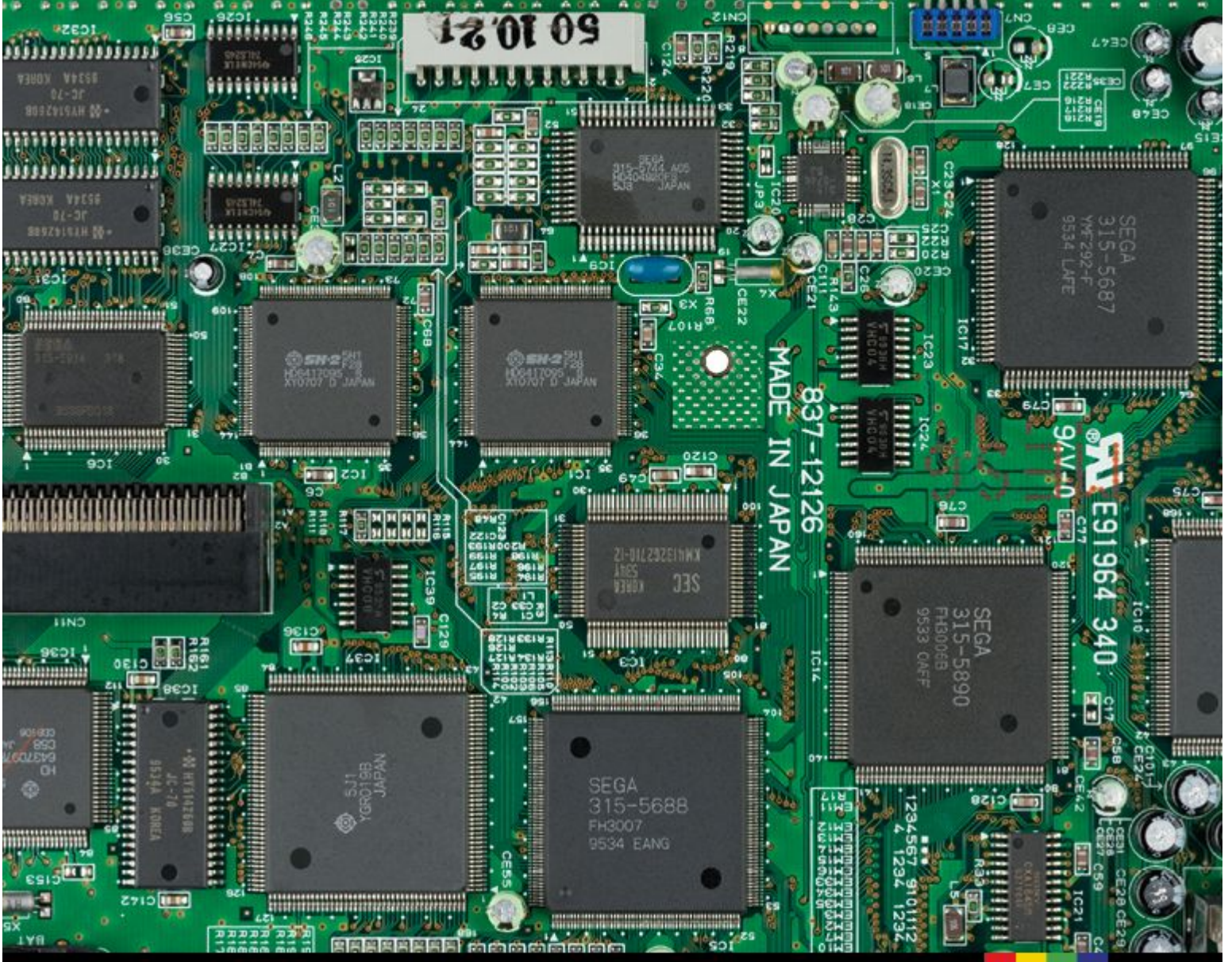


Fifth Generation

The video gaming industry underwent a massive transition in the fifth console generation as technology rapidly evolved and market players rose and fell. Optical media overtook cartridges due to their low cost and spacious storage capacity, while powerful and custom processors moved games from 2D to 3D. The era also saw a major exodus of hardware manufacturers such as Atari, NEC, 3DO, and Commodore, who dropped out or closed down due to poor sales of their systems. Most significantly, Sega and Nintendo were reduced to secondary players by Sony, a newcomer that blazed into the gaming market with a developer-friendly and well-marketed system that became one of the best-selling consoles of all time.

Sega Saturn motherboard (above), Sony PlayStation motherboard (opposite)

FM Towns Marty

1993

Launch price: ¥98,000	**Systems sold:** 50,000–75,000 (est.)
Processor: AMD 386SX at 16 MHz	**RAM:** 2 MB **VRAM:** 640 KB
Colors: 16,777,216	**Games released:** 500+

The FM Towns Marty was a stripped-down computer and console hybrid released exclusively in Japan by Fujitsu. The Marty was based off the FM Towns, a Japanese computer series introduced in 1989 that had a proprietary operating system and a CD drive built into every unit. The x86 computers were considered multimedia powerhouses but were expensive and attracted only a niche following with their high-quality arcade ports and creative software. When the console version hit the Japanese market in 1993, the Marty's high price and limited functionality led to low sales, and the system was discontinued in just two years.

Fujitsu also released an updated Marty II model in 1994, which was cheaper and came in dark gray.

Amiga CD32

1993

Launch price: $399	**Systems sold:** 50,000–75,000 (est.)
Processor: Motorola 68EC020 at 14 MHz	**RAM:** 2 MB
Colors: 16,777,216	**Games released:** 140+

The Amiga CD32 was another attempt by Commodore to repackage its 32-bit Amiga computer line into a multimedia games machine. After the failure of its CDTV just two years prior, Commodore was quick to turn around another Amiga-based system. The new CD32 was much cheaper than the CDTV and had better specs and a clearer focus on gaming. However, as IBM PCs began to overtake the computer market in the early 1990s, Commodore's standing and influence quickly diminished, which, along with other major financial issues, forced Commodore to declare bankruptcy and close down just months after the CD32's release.

The CD32's rear expansion bay could be outfitted with an optional MPEG video decoder.

3DO

1993

Launch price: $699	**Systems sold:** 1+ million (est.)
Processor: ARM60 RISC at 12.5 MHz	**RAM:** 2 MB **VRAM:** 1 MB
Colors: 16,777,216	**Games released:** 200+

The American-designed 3DO console was one of the first 32-bit systems ever released. In an unusual and ultimately disastrous move, the 3DO Company designed the console as a hardware standard that it licensed to foreign manufacturers to build and sell, mirroring the production model of VCRs, televisions, and CD players. To make a profit, third-party manufacturers had to sell 3DOs at a high price (console makers usually sell their systems at a loss or cost), making the 3DO much more expensive than other systems. The high price, heavy competition, and a spotty game library filled with FMV titles led to mild sales, and the 3DO was discontinued in 1996.

The Panasonic FZ-1, the first 3DO model, went from $699 to $299 in less that two years in an effort to boost sales.

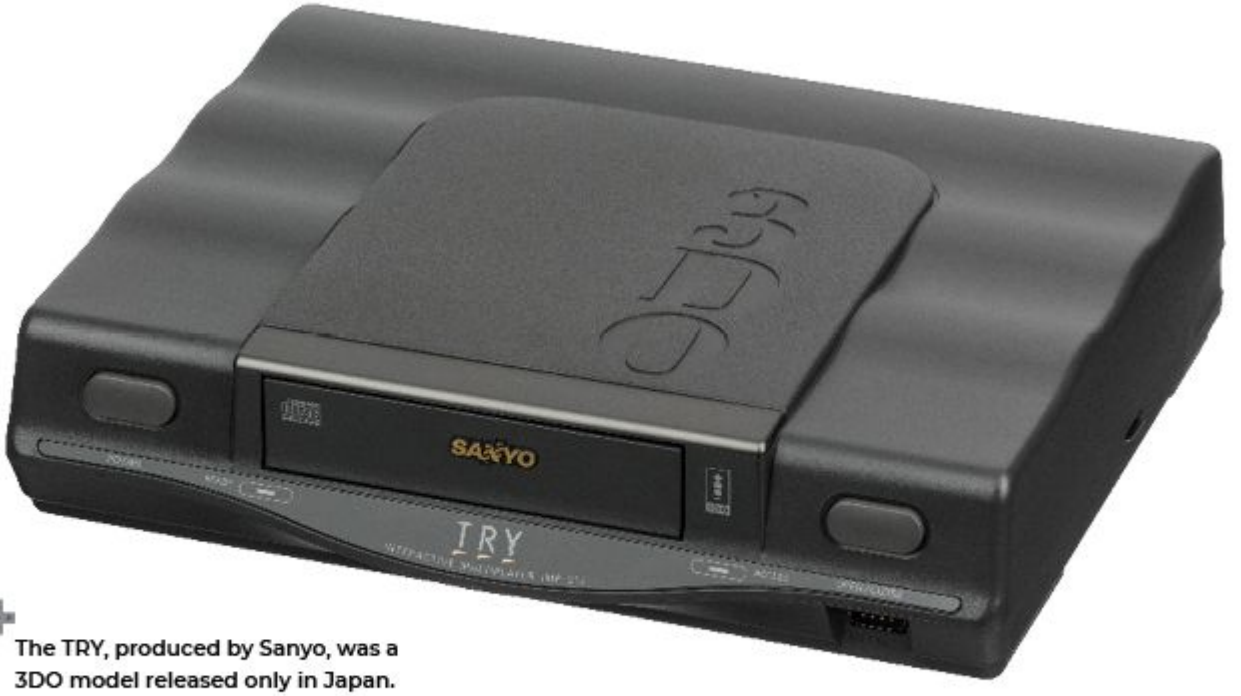
3DO systems featured an expansion slot that could be outfitted with an MPEG video decoder.

The Korean company Goldstar was the only manufacturer besides Panasonic to release a 3DO console in America.

3DO Variant Models

Trip Hawkins, the founder of the software giant Electronic Arts, left EA to found the 3DO Company in 1991. His radical plan for the 3DO platform necessitated third-party manufacturers, and Hawkins used his substantial industry connections to generate hype for the 3DO and sign up electronics companies to build consoles. While many hardware manufacturers initially pledged to create 3DO systems, most hesitated or waited due to the highly competitive and unpredictable console market. When the flagship 3DO model struggled at launch, most of these manufacturers dropped out completely, meaning only a fraction of the proposed systems were actually released.

The Panasonic FZ-10, released in 1994, was a cost-reduced update of the FZ-1 and featured a top-loading CD tray.



The TRY, produced by Sanyo, was a 3DO model released only in Japan.

Atari Jaguar

1993

Launch price: $249	**Systems sold:** 125,000–170,000 (est.)
Processors: "Tom" and "Jerry" at 26.6 MHz	**RAM:** 2 MB
Colors: 16,777,216	**Games released:** 63

The Jaguar was Atari's last console and the true successor to its 1986 Atari 7800. A powerful but deeply flawed system, the cartridge-based Jaguar had a complicated and difficult-to-use multiprocessor architecture. The system had all the troubles of other post-crash Atari consoles: a small game library, limited retail presence, and little third-party support, which all added to Atari's long-tarnished reputation that kept developers and consumers away. The Jaguar struggled and, even after multiple price cuts, sold fewer than 150,000 consoles after three years. Its failure marked the end of Atari as a company, which effectively ceased operations and sold off its assets.

After it was squeezed out of the computer industry in the early 1990s, the Jaguar was Atari's last chance to stay viable.

The Jaguar was manufactured in North Carolina by IBM.

Jaguar CD

Before the Jaguar launched in late 1993, Atari announced a CD drive add-on for the system that would soon follow. After many delays, the Jaguar CD finally released in September of 1995. By then the Jaguar was dead in the water, and the release of the CD drive after the Sega Saturn and Sony PlayStation had already come out proved futile. The Jaguar CD was available for only a short time before Atari's demise ended support, which resulted in just 13 games being released for the add-on.

The Atari Jaguar CD drive used a custom authoring format that could hold up to 790 MB of data per disc.

Some Jaguar games came with overlays that could be fitted over the controller's number pad.

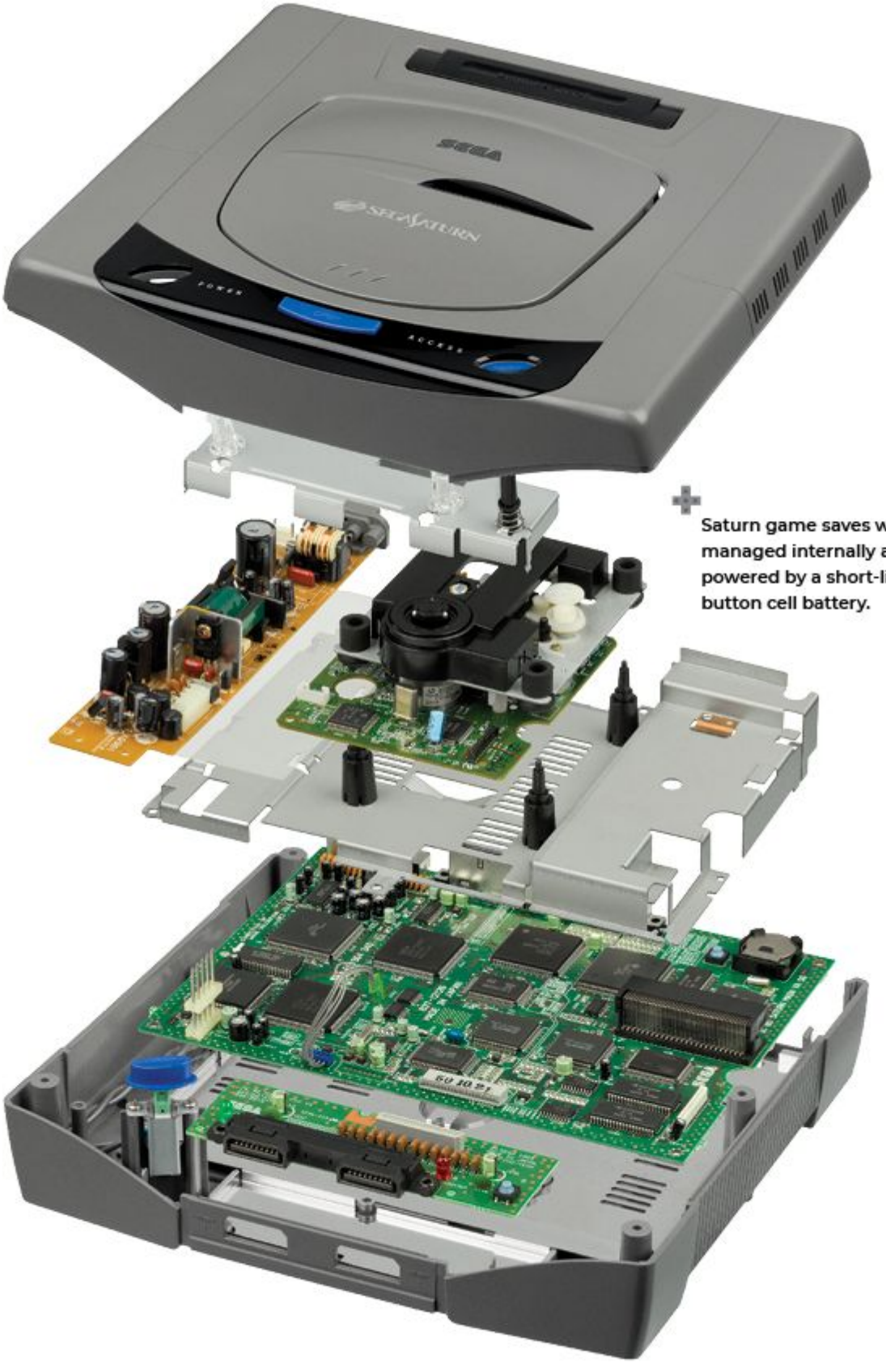
Sega Saturn

1994

Launch price: $399	**Systems sold:** 9+ million	
Processor: Two Hitachi SH-2 CPUs at 28.6 MHz	**RAM:** 2 MB (expandable)	**VRAM:** 1.5 MB
Colors: 16,777,216	**Games released:** 1,000+	

The Japanese arcade scene was thriving in the fall of 1994 when Sega, known for its arcade hits, launched the Saturn console. In Japan, the Saturn received a positive reception for its exclusive ports of Sega's 3D arcade games such as *Virtua Fighter*, *Daytona USA*, and *Virtua Cop*. The Saturn would also become the system of choice for 2D fighting games, as the console's architecture was more suited to them than the PlayStation's. The Saturn was a hit with Japan's hard-core gaming crowd, which gave Sega its first successful console in Japan. However, this success wouldn't repeat itself overseas, and the Saturn's failure abroad would severely hurt Sega.

The 32-bit Saturn was a complex console that was powered by eight different processors.



Saturn game saves were managed internally and powered by a short-lived button cell battery.

Sega Saturn in the United States

When Sony announced the PlayStation's US launch price as $299, Sega made the snap decision to surprise release its $399 Saturn early to undercut Sony. The now-infamous move resulted in confusion and anger from retailers and developers, who were unprepared for this early release. Early adopters had to wait months for new games and felt cheated by the Saturn's $100 price drop shortly after the PlayStation released. Additionally, third-party support dwindled, as developers abandoned the Saturn and its difficult architecture for the PlayStation. Sales cooled rapidly in the next year, and Sega lost the huge US market share it had gained with the Genesis.

The American Saturn controller was bulky and poorly received, and it was eventually replaced by the Japanese version.

Before Saturn's NetLink, the Sega Genesis had two different modems used for either head-to-head play (XBAND) or game downloads (Sega Channel).

NetLink Modem and Internet Capability

Console modems produced in partnerships with local telecoms had existed as far back as the Intellivision. These devices offered some kind of internet access or service that was usually limited, experimental, or short lived. The Sega Saturn was one of the first consoles to offer a full internet experience with its optional NetLink adapter. This 28.8 Kbps modem let users browse the web, send emails, and play five supported games against other NetLink owners.

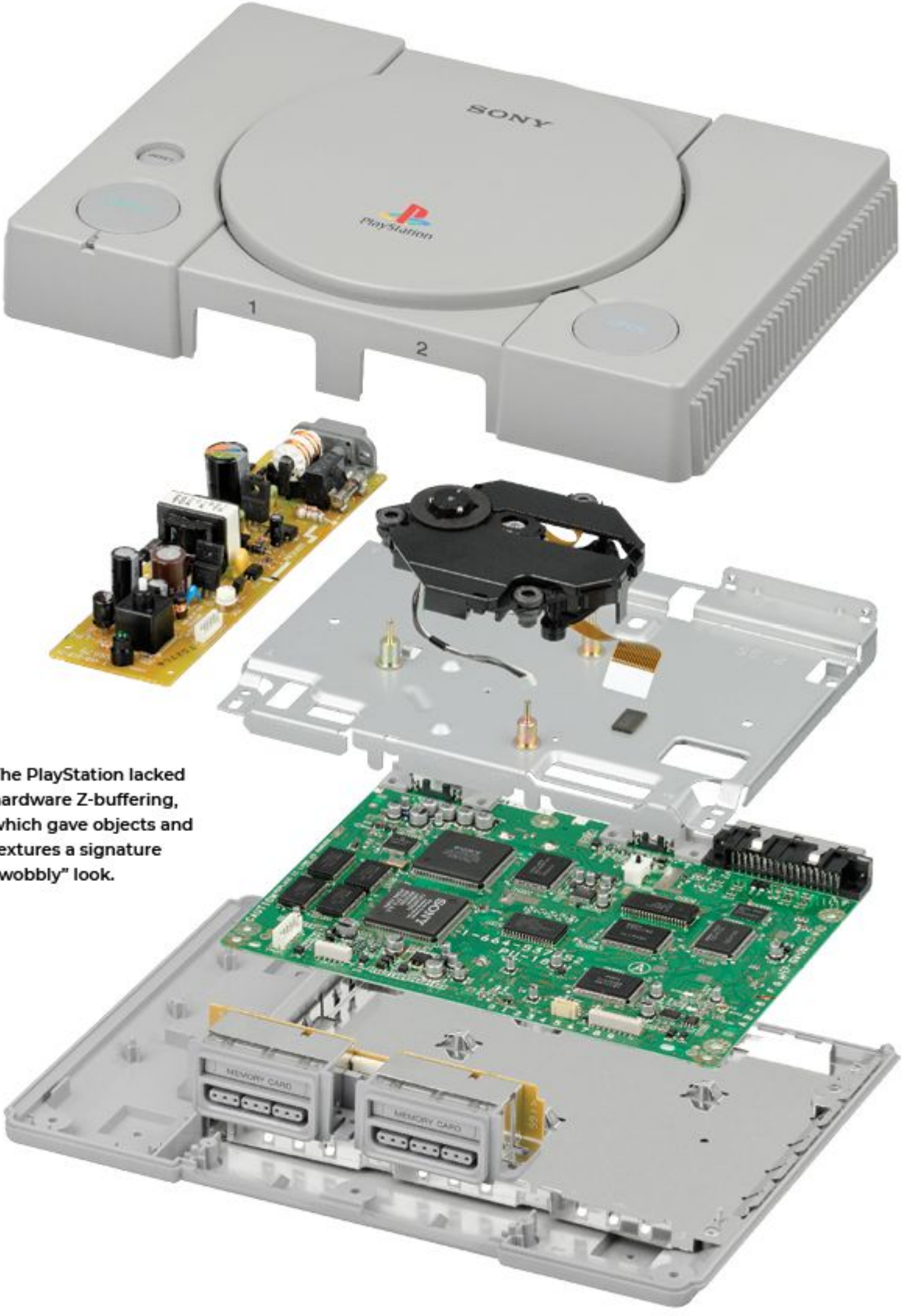
Sony PlayStation

1994

Launch price: $299	**Systems sold:** 100+ million
Processor: LSI/MIPS R300A at 33.8 MHz	**RAM:** 2 MB **VRAM:** 1 MB
Colors: 16,777,216	**Games released:** 2,400+

The PlayStation was a 32-bit console from Sony, the major Japanese electronics manufacturer. Sony put its vast resources behind the PlayStation and launched its debut system with a huge marketing campaign and a diverse lineup of games. The PlayStation and its impressive 3D graphics quickly established Sony as a major player in the console market. The system also greatly benefitted from the mistakes made by Sega and Nintendo, whose difficult-to-program consoles drove third-party developers straight to Sony. The result was a massive game library that helped to make the PlayStation one of the best-selling consoles of all time.

Prior to its release, the PlayStation was often referred to as the PSX (the console's original code name) by Sony and the press.



The PlayStation lacked hardware Z-buffering, which gave objects and textures a signature "wobbly" look.

The Sony PocketStation (right) was a memory card exclusive to Japan that could play games on its tiny LCD screen.

Memory Cards

The CD provided game developers with cheap, high-capacity media, but it also removed the onboard save function that was common in many cartridge games. While systems like the Saturn, 3DO, and Sega CD relied on internal memory to save game progress, Sony chose an external memory card scheme for its PlayStation console. After the PlayStation's immense success, these simple and swappable memory cards became the standard for later sixth-generation consoles.

Sony's DualShock controller, released in 1997, added analog joysticks and dual rumble motors.

PS one

In 2000, Sony updated the PlayStation with a new model called the PS one. Its revamped design was drastically smaller and lighter than the original and could be paired with an optional LCD screen for a semiportable experience. In America, it released at just $99 alongside Sony's new PlayStation 2. Even though it competed with next-generation consoles, the inexpensive PS one and its large back catalog of hit games was a massive success, selling more than 28 million systems worldwide.

Sony's official 5-inch LCD screen add-on cost $129 at launch or sold bundled with the PS one for $199.

The PlayStation's parallel port was mainly used by third-party cheat devices such as the GameShark.

PlayStation Console Revisions

Sony has continuously revised its game consoles and handhelds to make them smaller, cheaper, and more reliable. Some systems also become more streamlined as rarely used features are removed over time. This can be seen on the original PlayStation, whose A/V jacks, parallel port, and serial port disappeared over its lifetime.

Bandai Playdia

1994

Launch price: ¥24,800	**Systems sold:** 200,000+ (est.)
Processor: Toshiba TMP87C800F at 8 MHz	**RAM:** 256 KB **VRAM:** 512 KB
Colors: 16,777,216	**Games released:** 33

The Playdia was a CD-based console that was created by the Japanese toy company Bandai. Released exclusively in Japan, the Playdia was a nontraditional system designed for children and families. More like a video player than a games console, the system could play only FMV titles with limited interaction. Most of its games were educational and based on popular Bandai properties such as *Sailor Moon*, *Gundam*, and *Dragon Ball Z*. While the Playdia was never meant to contend with standard gaming consoles, system sales were only modest, and no third-party games were released. Support for the Playdia ended in 1996 with the release of the Bandai Pippin.

Before the Playdia, Bandai produced *Pong* consoles and LCD handhelds.

NEC PC-FX

1994

Launch price: ¥49,800	**Systems sold:** 400,000 (est.)
Processor: NEC V810 at 21.5 MHz	**RAM:** 2 MB **VRAM:** 1.25 MB
Colors: 16,777,216	**Games released:** 62

The PC-FX was NEC's long-awaited 32-bit successor to the PC Engine and was released exclusively in Japan alongside the Saturn and PlayStation. However, unlike those consoles, the PC-FX was incapable of rendering polygonal 3D graphics and instead focused on 2D sprites and full-motion video. It was a fatal mistake for the system and caused the expensive PC-FX to look underpowered and outdated as the industry quickly transitioned to 3D. Former PC Engine fans flocked to new systems, and after the console placed a distant fourth to the Saturn, PlayStation, and N64, NEC dropped out of the console market entirely.

Anime games with lots of FMV cutscenes made up most of the PC-FX's small library.

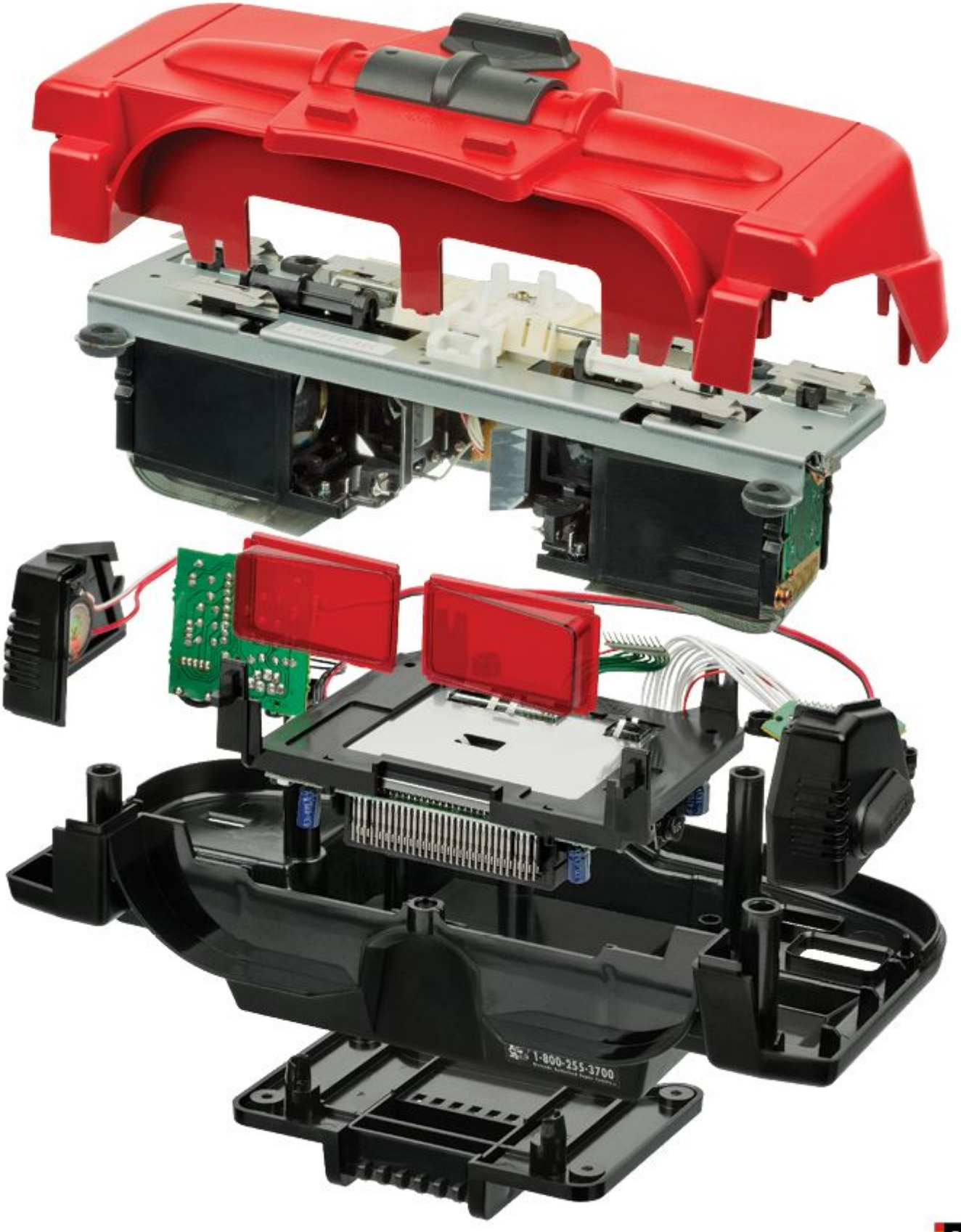
Virtual Boy

1995

Launch price: $179	**Systems sold:** 770,000–1,000,000
Processor: NEC V810 at 20 MHz	**RAM:** 1 MB
Colors: 4 (red monochrome)	**Games released:** 22

The Virtual Boy was a semiportable console from Nintendo that featured a monochrome, stereoscopic 3D display made from red LEDs. While originally envisioned as a wearable visor with head tracking, various technological compromises and limitations instead reduced the system to an awkward tabletop experience. The Virtual Boy received a tepid reception at launch, with game reviewers criticizing the system's cost, gimmicky nature, and headache-inducing display. After just a few months of slow sales—even after price cuts—Nintendo discontinued the Virtual Boy, making it one of the company's rare failures.

The Virtual Boy used high-speed, oscillating mirrors to project an image into each eye.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Tiger R-Zone

1995

Launch price: $29	**Systems sold:** Unknown
Processor: Sharp SM51X (on cartridge, can vary)	**RAM:** N/A
Color: 2 (black and white)	**Games released:** 25+

Tiger Electronics was an American toy and game company well known in the 1980s and 1990s for its handheld LCD games. In 1995, Tiger reworked its handheld games into the R-Zone, which put the LCD screen into a swappable cartridge as a transparent window. The R-Zone's launch system was an odd, strap-on headset that projected the cartridge's LCD screen onto a small eye visor. The result was hard to see, awkward to play, and not much fun. Even with a low price and a game library based on hit franchises such as *Batman*, *Star Wars*, and *Mortal Kombat*, the popularity of cheap LCD games was in steep decline, and the R-Zone line was discontinued in 1997.

Tiger Electronics was a master of the quick turnaround, churning out cheap LCD games based on popular movies, TV shows, and console video games.

A small light bulb in the R-Zone X.P.G. projected the cartridge's LCD screen onto a red mirror instead of a visor, though the result was still awkward to see and play.

Variant R-Zone Models

The original R-Zone's headset design was gimmicky and difficult to use, which Tiger remedied by releasing a variety of more conventional R-Zone players. The Xtreme Pocket Gamer (X.P.G.) was a handheld system that projected the LCD cartridge onto a red mirror. The SuperScreen was a tabletop player that used a light bulb to project the game's LCD onto a large screen. The rarest R-Zone model was the DataZone, a data organizer for teens that had a slot for inserting R-Zone cartridges.

Super A'can

1995

Launch price: NT$2,900	**Systems sold:** 10,000–20,000 (est.)
Processor: Motorola 68000 at 10.7 MHz	**RAM:** 64 KB **VRAM:** 128 KB
Colors: 32,786	**Games released:** 12

The Super A'can was a cartridge-based, 16-bit console that was released exclusively in Taiwan. The system was designed by a subsidiary of the Taiwanese semiconductor manufacturer UMC, a company known for producing chips for console clones and bootleg games. UMC designed the custom sound and graphics chips for the console, which were paired with a standard 68000 CPU. The result was an average and outdated 16-bit console that was released alongside new, cutting-edge 32-bit systems and the mature 16-bit Super Famicom and Mega Drive. At launch, the Super A'can was a massive flop, and the system was discontinued just months after its debut.

A CD add-on drive and 32X-style expansion were announced at launch but were never released.

Casio Loopy

1995

Launch price: ¥25,000	**Systems sold:** 150,000–200,000 (est.)
Processor: Hitachi SH7021 at 20 MHz	**RAM:** 512 KB
Colors: 32,786	**Games released:** 10

Twelve years after it produced the PV-1000, Casio returned to the home game console market with the Loopy, the first system developed for and marketed at girls. The Japan-exclusive, cartridge-based console played simple games with 2D graphics, but its standout feature was a built-in printer. The thermal printer could make color stickers using specially treated paper cartridges, and the Loopy's small library of dress-up and romance games all revolved around printing stickers. Users could also make their own custom stickers with an optional accessory that imported video from a TV, VCR, or camcorder.

In Japan in the mid-1990s, new photo booths that overlaid images with cutesy graphics and printed on stickers were becoming popular.

Nintendo 64

1996

Launch price: $199	**Systems sold:** 30+ million
CPU: NEC/MIPS 4300i at 93.75 MHz	**RAM:** 4.5 MB (expandable)
Colors: 16,777,216	**Games released:** 380+

The fifth gen's last major home console was the Nintendo 64 (N64), a cartridge-based 64-bit system with advanced 3D graphics. Its late entry was the result of multiple delays, which gave Sony's popular PlayStation a massive lead over Nintendo. After the console launched, it struggled to attract third-party developers, which were put off by the N64's expensive game cartridges and a difficult-to-program-for architecture. Though Nintendo lost its market lead to Sony, critically acclaimed games such as *Super Mario 64* and *The Legend of Zelda: Ocarina of Time* made the Nintendo 64 a success that is still fondly remembered today.

The Nintendo 64's costly cartridges were on average $20 more expensive than the PlayStation's or Saturn's CD games.

The Nintendo 64 could be upgraded with an additional 4 MB of RAM via an expansion pack (shown above in red).

Nintendo 64 Controllers and Expansion Paks

The Nintendo 64's unusual multiprong controller could be held multiple ways for different play setups, though in reality few games ever used the D-pad. An expansion port underneath the controller supported memory cards, an adapter for Game Boy cartridges, and the Rumble Pak: a motor that vibrated in sync with onscreen action.

The Nintendo 64 controller's analog thumb stick was made from plastic parts that would grind away and become loose over time.

Nintendo 64DD

The 64DD was a magnetic disk drive add-on that promised more storage, a real-time clock, and disks that were rewritable. The system was intended to have have its own unique disk games (*Zelda 64* was proposed as the flagship title) or could have disks that worked with cartridge games to add extra content. However, despite being announced before the Nintendo 64 was even launched, the 64DD was delayed for three years due to numerous problems, and most of its proposed games had to be canceled or ported to cartridge. After a small, Japan-only release in 1999, Nintendo quietly dropped the add-on, which had fewer than 10 games made for it.

Most 64DDs were bundled with a modem and a subscription to an online web-browsing service called Randnet.

iQue Player

The "Divine Gaming Machine" (commonly referred to as the iQue Player) was an N64 developed for the Chinese market in partnership with the Chinese company iQue. The console's hardware was all contained within the controller, and games were stored on a removable flash drive. New games could be bought and loaded onto the flash drive through kiosks or an online PC store.

Apple Pippin

1996

Launch price: $599	**Systems sold:** 40,000
Processor: Motorola PowerPC 603 at 66 MHz	**RAM:** 6 MB (expandable)
Colors: 16,777,216	**Games released:** 20

The Pippin was a hybrid computer and game console platform created by Apple Computer and built and distributed by Bandai. Apple designed the platform to expand its Mac operating system to the multimedia box and video game markets, but it left almost all aspects of its rollout to Bandai, which built the system, produced games, and handled its advertising. At launch, the system was an immediate disaster due to the Pippin's high price, small game library, limited computer functionality, and sparse retail availability. With abysmal sales in the United States and Japan, Bandai incurred heavy losses that almost crippled the company.

The Pippin's lack of a hard drive meant its operating system had to be stored on every CD and loaded at the console's startup.

Tiger Game.com

1997

Launch price: $69.99	**Systems sold:** 200,000–300,000 (est.)
Processor: Sharp SM8521	**RAM:** N/A
Colors: 4 (monochrome)	**Games released:** 20

Tiger Electronics followed up its failed R-Zone line with the Game.com: a low-priced handheld with black-and-white graphics powered by an 8-bit processor. The Game.com featured a touchscreen and stylus, and it had PDA functionality like a built-in calendar, phone book, and calculator. The system had a small library of games, and though that list included impressive-sounding titles like *Resident Evil 2*, most were low-effort ports with bad gameplay and choppy framerates. Tiger released a smaller and streamlined version of the Game.com a year after the original, but with low sales, the handheld was eventually discontinued in 1999.

With an external 14.4K modem, the Game.com could access email and do limited text-based web browsing.

Game Boy Color

1998

Launch price: $69	**Systems sold:** 118+ million (all models)
Processor: Sharp LR35902 at 4.19 or 8.39 MHz	**RAM:** 32 KB **VRAM:** 16 KB
Colors: 32,768	**Games released:** 1,000+ (all models)

The Game Boy Color was an enhanced and revamped Game Boy with a color screen, a faster processor, and more memory. The new Color handheld was fully backward compatible with the regular Game Boy and also played its own library of enhanced titles. While not a true generational leap over the previous Game Boy, the Color was another hit for Nintendo, in part because of a new Game Boy series called *Pokémon*. *Pokémon*, a game about collecting and trading fighting creatures, became a worldwide phenomenon that spawned a hit TV show and countless toys and also gave the Game Boy a second wind almost 10 years after its initial release.

The Game Boy Color was the king of battery life, capable of running for over 30 hours with just two AA batteries.

GAME BOY COLOR
Nintendo
CGB-CPU-02

Neo Geo Pocket

1998

Launch price: $69	**Systems sold:** 1+ million (all models)
Processor: TLCS-900H at 6.144 MHz	**RAM:** 12 KB **VRAM:** 16 KB
Colors: original: 8 (monochrome), Color: 4,096	**Games released:** 9 (original), 80+ (Color)

The Neo Geo Pocket was a 16-bit portable console from SNK that was released primarily for the Japanese gaming market. The modest, two-button handheld featured a monochrome LCD screen and played simplified versions of popular SNK arcade games. After its release, the Pocket faced heavy competition from the new Game Boy Color and WonderSwan handhelds, which prompted SNK to quickly release a new color version of the system in 1999. However, this only mildly boosted sales, as the Game Boy continued its market domination and the WonderSwan secured important third-party support, putting the Neo Geo Pocket in third place.

While the original Neo Geo Pocket stayed in Japan, its later Color model was released worldwide in 1999.

The Neo Geo Pocket Color displayed up to 146 colors at once, far more than the original's 8 shades of gray.

WonderSwan

1999

Launch price: ¥4,800	**Systems sold:** 3.5 million
Processor: NEC V20 at 3.072 MHz	**RAM:** 16 KB (original), 64 KB (Color)
Colors: original: 8 (monochrome), Color: 4,096	**Games released:** 100+ (original), 90+ (Color)

The WonderSwan was a 16-bit black-and-white handheld game system conceived by Gunpei Yokoi, the former Nintendo engineer that had created the Game Boy. Yokoi's new company, Koto Laboratory, produced toys, electronic games, and the WonderSwan. The system was picked up by Bandai and released exclusively in Japan in 1999. The WonderSwan, like the Game Boy, was an extremely battery-efficient system that could run for more than two dozen hours off a single AA battery. It also had a quirky dual-control method that meant the system could be played either vertically or horizontally, which was useful for the WonderSwan's puzzle games.

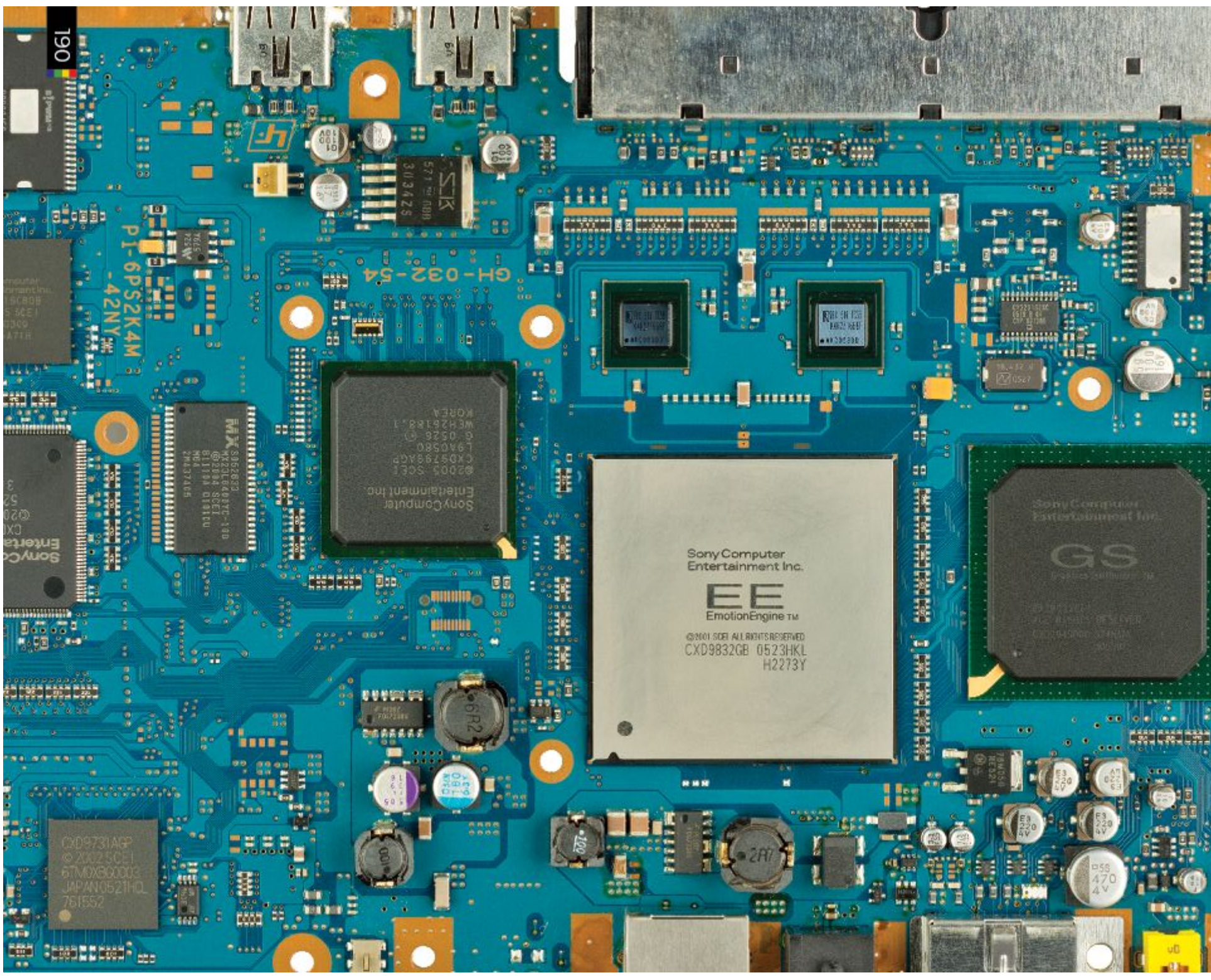
Gunpei Yokoi died tragically in an auto-related accident in 1997, missing the launch of the system he helped design.

The WonderSwan Color and SwanCrystal were capable of displaying up to 241 different colors at the same time.

Square brought *Final Fantasy* and other RPGs to the WonderSwan Color starting in 2000, which was a huge sales boost for the system.

WonderSwan Color and SwanCrystal

The WonderSwan's biggest challenge was coming out a few months after the release of the Game Boy Color, which made color graphics the new standard on handhelds. Bandai reacted by releasing a new color version of the handheld, the WonderSwan Color, just a year after the original. Overall, the WonderSwan series was a modest success, thanks to a selection of quality, exclusive games from third parties, but the system wasn't able to take on the juggernaut Nintendo. In 2002, Bandai released a final version with an improved color screen, the SwanCrystal, but discontinued the console the next year.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Sixth Generation

The sixth generation of consoles saw the number of hardware manufacturers shrink to three main players, as fewer and fewer companies could handle the massive cost of releasing and supporting a new system. Sony continued to dominate with its new PlayStation 2 console, which left everyone else to fight for second place. Sega, after suffering heavy financial losses with the Saturn and Dreamcast, left the console market and became a third-party game developer. Microsoft, a newcomer, used its deep pockets to endure heavy financial losses to establish its Xbox console. As for Nintendo, its GameCube struggled to stand out against the PlayStation 2 and Xbox, which led the company to abandon direct competition and turn to new ideas and audiences as it moved onto the next console generation.

GameCube motherboard (above), PlayStation 2 Slim motherboard (opposite)

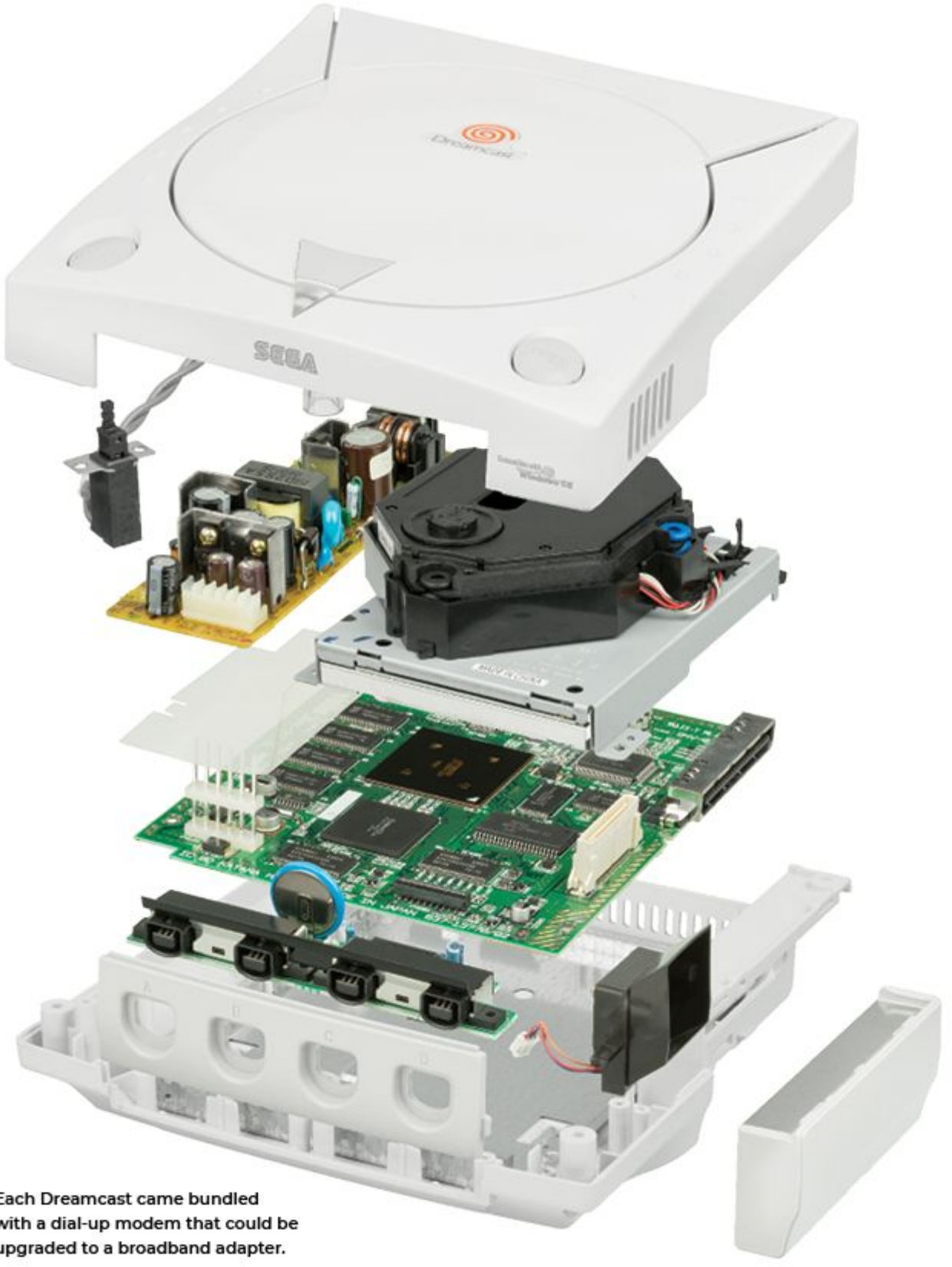
Sega Dreamcast

1998

Launch price: $199	**Systems sold:** 9+ million
CPU: Hitachi SH-4 RISC at 200 MHz	**RAM:** 16 MB **VRAM:** 8 MB
GPU: NEC PowerVR2 at 100 MHz	**Games released:** 600+

After the failure of its Saturn console, Sega lost much of its fan base to the PlayStation. With the company hemorrhaging money, Sega could ill afford another failure. Its next console, the Dreamcast, would be a last-ditch effort to regain lost market share and return to profitability. At launch, the system and its games were well received, but the Dreamcast was not the massive hit Sega needed to keep itself afloat. After disappointing sales in the 2000 holiday season, Sega announced it was leaving the hardware business to become a software developer and publisher for other systems.

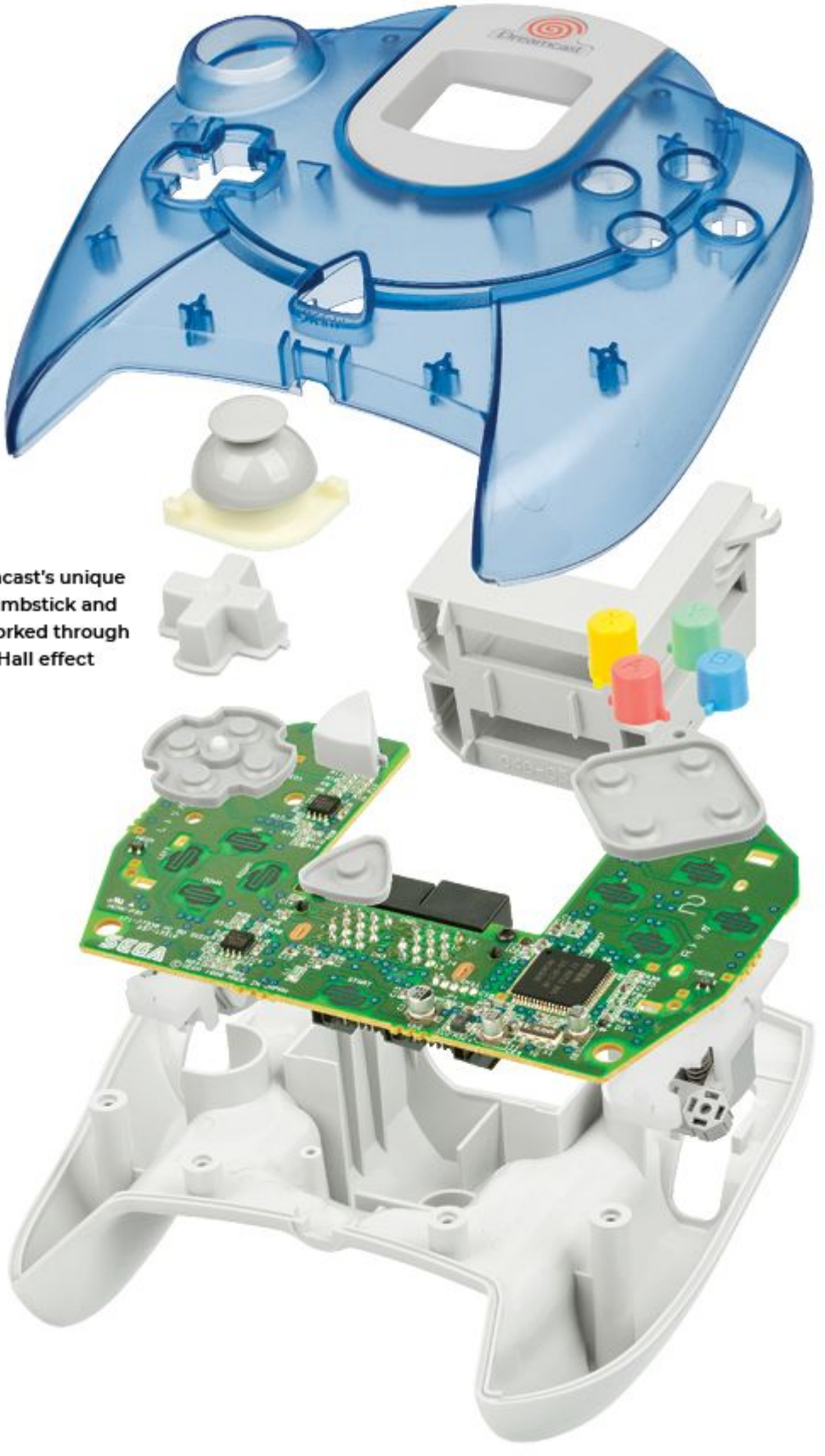
In America, the Dreamcast launched on September 9th, 1999, or 9/9/99.



Each Dreamcast came bundled with a dial-up modem that could be upgraded to a broadband adapter.

Visual Memory Unit

The Dreamcast's bulky controller housed two expansion slots that could be used for memory cards, a rumble pack, or a microphone. The memory card, called the Visual Memory Unit (VMU), was far more advanced than the N64's and incorporated a screen and controls for use independent of the console. On their own, users could manage and transfer saves or play mini-games downloaded from select titles such as *Sonic Adventure*. When slotted into the controller during gameplay, the tiny screen could display information such as character health.



The Dreamcast's unique analog thumbstick and triggers worked through magnetic Hall effect sensors.

PlayStation 2

2000

Launch price: $299	**Systems sold:** 155+ million
CPU: Custom "Emotion Engine" at 295 MHz	**RAM:** 32 MB
GPU: Custom "Graphics Synthesizer" at 147 MHz	**Games released:** 2,400+

As the best-selling video game system of all time, the PlayStation 2 dominated the sixth console generation, selling more than 155 million systems worldwide. The success of the original PlayStation helped build hype for the PS2, and the console sold out quickly to massive crowds at launch. With strong third-party support and an extensive library of critically acclaimed games, the PS2 pushed the Sega Dreamcast out of the market and shrugged off competition from Nintendo's GameCube and Microsoft's Xbox. The console would remain popular throughout the decade, with slimmer, redesigned models selling well even years after the release of the PlayStation 3.

The PS2 was backward compatible with the original PlayStation's games, controllers, and memory cards.

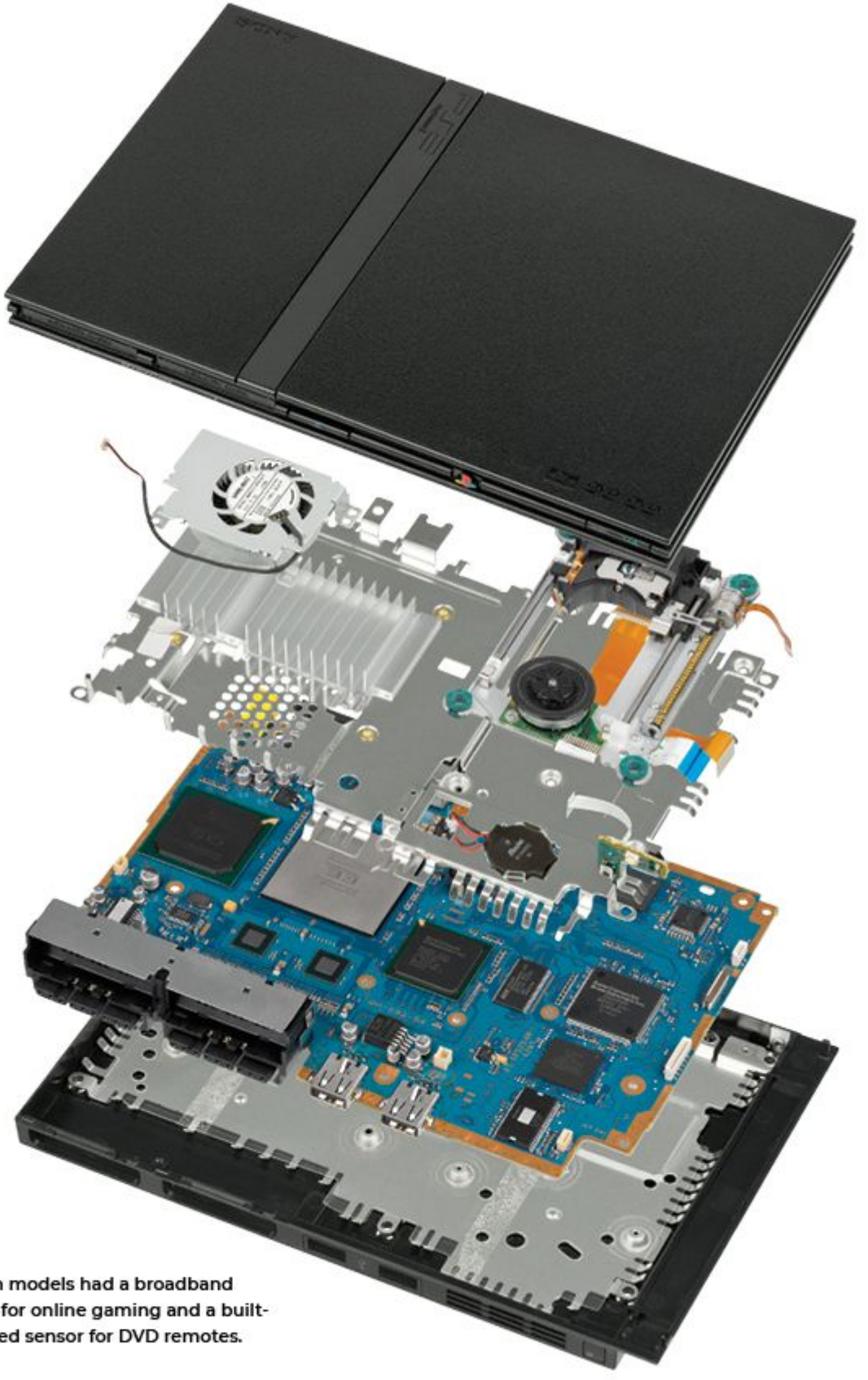
Sold separately, the PS2 remote made watching movies much easier.

DVD Movie Playback

At the time of the PlayStation 2's release, DVD players were still relatively new and expensive. Sony's ability to offer a gaming console that could also play DVD movies (at a cost not much higher than that of stand-alone DVD players) was a big selling point for the system. For many gamers, the PS2 was their first and primary DVD player.

PlayStation 2 Slim Series

Continuing the tradition that began with the original PlayStation, Sony updated its PlayStation 2 console in 2004 with a much smaller and more power-efficient design. Dubbed the "Slim," this new PlayStation 2 (above right) offered a dramatic reduction in size and weight, partly achieved through removing the internal 3.5" hard drive bay and externalizing the power supply. A new Slim model, released in 2007 (above left), shrunk the internal components enough to incorporate the power supply into the console and eliminate the external power supply entirely.



PS2 Slim models had a broadband adapter for online gaming and a built-in infrared sensor for DVD remotes.

Nuon

2000

Launch price: $350	**Systems sold:** Unknown
Processor: Custom quad-core "Aries" chip	**RAM:** 32 MB (variable)
Manufacturers: Toshiba, Samsung, and RCA	**Games released:** 8

The Nuon was a short-lived, hybrid DVD player and video game platform released by VM Labs in 2000. The Nuon was based on a custom chip built by VM Labs that replaced the standard video decoder found in most DVD players and greatly improved the players' capabilities. With a Nuon chip installed, a DVD player was effectively turned into a video game console, with 3D graphics on par with the Nintendo 64. However, most electronics manufacturers weren't interested due to the increased costs, and only a few Nuon models were produced. After the release of a handful of poorly received games, VM Labs filed for bankruptcy in late 2001.

Only four DVD movies used the Nuon's enhanced abilites: *Bedazzled*, *Dr. Dolittle 2*, *Planet of the Apes (2001)*, and *The Adventures of Buckaroo Banzai Across the 8th Dimension.*

GP32

2001

Launch price: ₩ 179,000	**Systems sold:** 30,000
Processor: Samsung ARM920T	**RAM:** 8 MB
Resolution: 320×240 pixels	**Games released:** 25+

The GP32 was an ARM-based handheld from the Korean company GamePark that sold in Korea and select European markets. Unlike traditional systems, the GP32 was an open source platform and used a standard memory card rather than proprietary game cartridges. While the system had a small library of official games and some notable homebrew titles, many owners mainly used the GP32 as a portable emulator to play older 8- and 16-bit systems. After its release, multiple engineers from the GP32 project broke off to form a new company, which continued to develop open source handhelds that focused on emulation throughout the 2000s.

Three different GP32 models were released. The first used a non-lit LCD; the second upgraded to a front-lit display; and the third "Blu" model, shown here, used a backlight.

Game Boy Advance

2001

Launch price: $99	**Systems sold:** 80+ million
Processor: ARM7TDMI at 16.8 MHz	**RAM:** 32 KB + 256 KB **VRAM:** 96 KB
Resolution: 240×160 pixels	**Games released:** 1,000+

It took 12 years for Nintendo to create a true successor to its massively popular Game Boy handheld console. Released in 2001, the Game Boy Advance improved on the original Game Boy with a 32-bit processor, new shoulder buttons, and a larger, color screen. With an impressive game library that had strong third-party support and first-party best sellers such as *Pokémon* and *Mario Kart*, the Advance became another hit for Nintendo, selling more than 80 million units in just six years. One major flaw of the handheld, however, was its non-backlit LCD screen, which was difficult to see without direct light and would be fixed in later redesigns.

The Game Boy Advance was backward compatible with original Game Boy games, doubling its total game library.

Nintendo replaced the SP's frontlit LCD screen with a backlit display in 2005, which drastically improved its brightness and vibrance.

Game Boy Advance SP and Micro

Two years after the launch of the Game Boy Advance, Nintendo updated the handheld with a clamshell design and released it as the Game Boy Advance SP. Almost half the size of the original, the SP had a built-in, rechargeable battery and frontlit LCD screen. In 2005, Nintendo released the Game Boy Micro, a short-lived variant that was drastically smaller than the original and featured interchangeable faceplates.

Game Boy Advance e-Reader

With Nintendo's e-Reader add-on, Game Boy Advance users could unlock games and features through collectible cards. Players could load early NES-era games such as *Balloon Fight*, *Tennis*, and *Urban Champion* by buying card packs and scanning specialized barcodes printed on the card's edge.

The e-Reader came bundled with sample cards that included a full version of the Game & Watch game *Manhole*.

GAME BOY ADVANCE

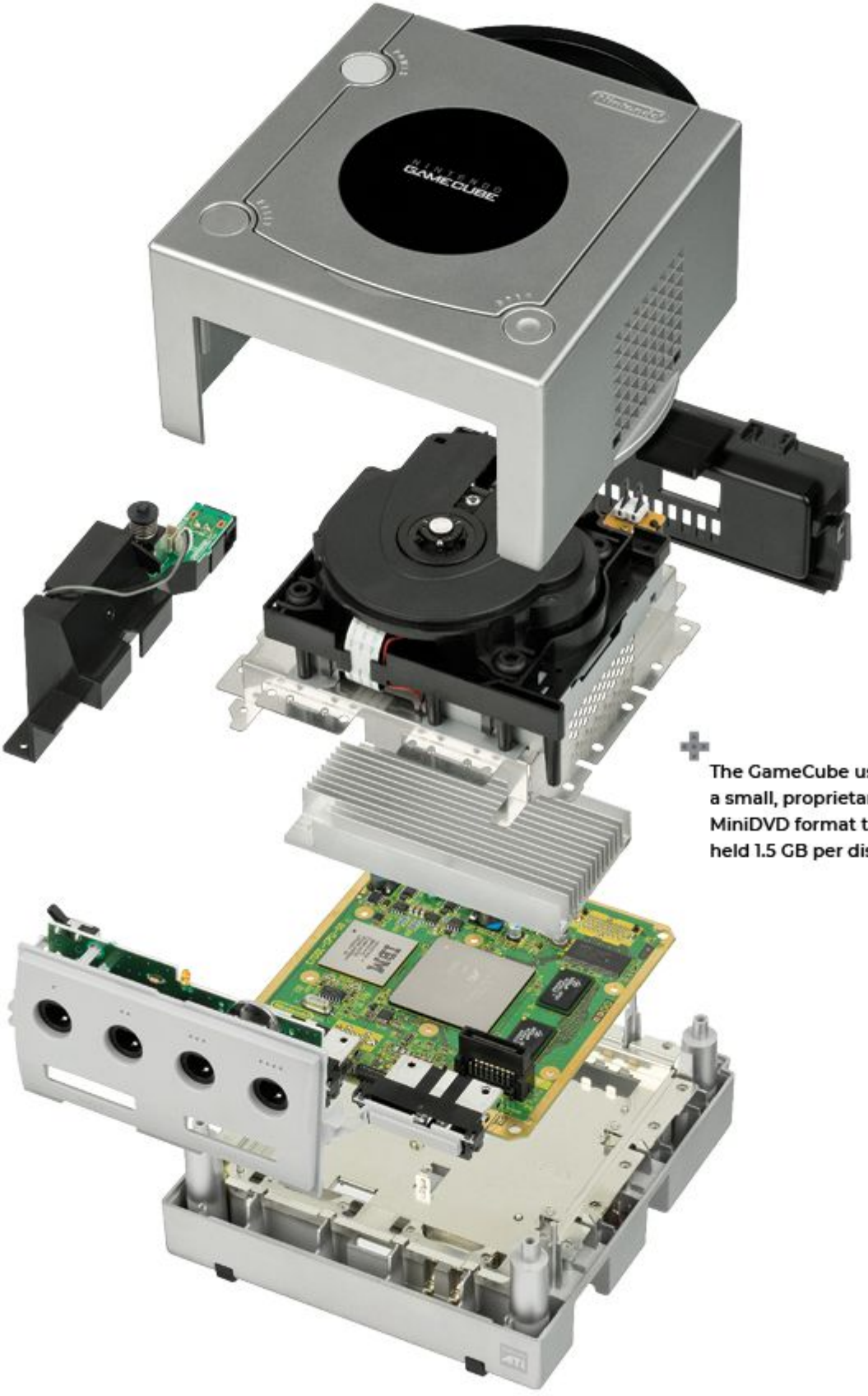
Nintendo GameCube

2001

Launch price: $199	**Systems sold:** 21+ million
CPU: Custom PowerPC "Gekko" at 485 MHz	**RAM:** 24 MB
GPU: Custom ATI "Flipper" at 162 MHz	**Games released:** 650+

The GameCube was Nintendo's compact successor to the N64 and its first console to use optical media. It entered a fiercely competitive market, where it faced off against the established PlayStation 2 and the well-funded upstart Xbox. The GameCube emphasized fun, had quality graphics, and was backed by a strong library of exclusive first- and third-party titles, but the boxy console suffered from a kid-friendly image that kept some older gamers away. Despite its loyal fan base, the system continued a downward trend in console sales for Nintendo, which led the company to rethink its place in the market as it moved forward.

The GameCube's best-selling title was *Super Smash Bros. Melee*, which sold over 7 million copies worldwide.



The GameCube used a small, proprietary MiniDVD format that held 1.5 GB per disc.

Panasonic Q

A major criticism of the GameCube was its inability to play DVD movies, a feature offered by its main rivals, the PlayStation 2 and Xbox. Nintendo nixed movie playback to avoid paying DVD-licensing fees, and DVDs couldn't even fit into the system due to the small-disc format chosen to combat piracy. However, a GameCube that could play DVD movies did exist, but it was only released in Japan. Produced by Panasonic and simply named the "Q," the DVD player and console hybrid featured a steel chassis with direct audio/video outputs. The Q was an expensive and niche system that had a small production run, making it a rare and highly sought-out item for collectors today.

At the time of the Panasonic Q's release, an American gamer could expect to pay $400 to $500 for an imported, region-modded system.

NINTENDO
GAMECUBE
MITSUMI

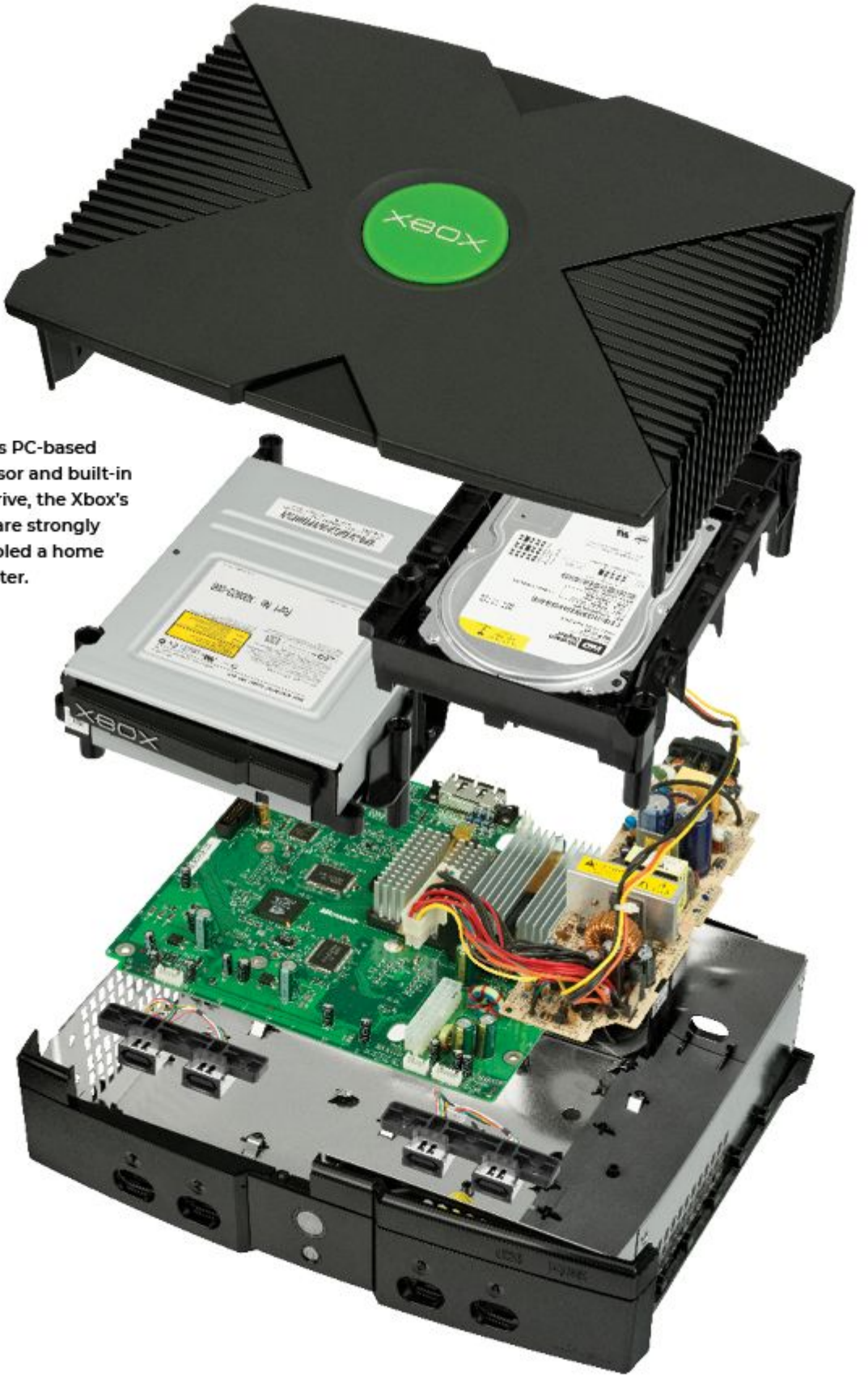
Microsoft Xbox

2001

Launch price: $299	**Systems sold:** 24+ million
CPU: Custom Intel Pentium III at 733 MHz	**RAM:** 64 MB
GPU: Custom Nvidia XGPU at 233 MHz	**Games released:** 1,000+

The massive success of Sony's PlayStation had caught the attention of software giant Microsoft, which began development of its own console in the late 1990s. The result was the Xbox, a powerhouse system that had more features and better graphics than both the PlayStation 2 and Nintendo GameCube. Microsoft took on heavy losses to get a foothold into the market, paying for exclusive titles and pushing a massive advertising campaign while also selling the system at a loss. Microsoft's aggressive strategy worked, and while not as popular as the PS2, the Xbox beat out the veteran Nintendo for a second-place finish, largely due its performance in the United States.

The Xbox had a built-in broadband adapter for local network and online gaming.



With its PC-based processor and built-in hard drive, the Xbox's hardware strongly resembled a home computer.

The original Xbox "Duke" controller (top) was replaced by a smaller "S" variant (bottom) in 2002.

The Xbox controller featured two expansion slots that could hold memory cards or a chat headset adapter.

Nokia N-Gage

2003

Launch price: $299	**Systems sold:** 3 million
Processor: ARM920T at 104 MHz	**RAM:** 8 MB
Resolution: 176×208 pixels	**Games released:** 50+

The N-Gage was a hybrid cell phone and handheld gaming console created by the mobile giant Nokia. At launch, the system was largely panned by reviewers, who criticized the N-Gage's awkward design, short battery life, and vertically orientated screen that was ill-suited for most games. Sales of the N-Gage were far below Nokia's expectations, as most gamers ignored the system in favor of dedicated handheld consoles such as the Game Boy Advance. Price drops and a 2004 "QD" remodel that fixed some of the original's design issues did little to increase sales, which led Nokia to discontinue the N-Gage in 2006.

In 2008, the N-Gage was revived as a digital-download gaming platform for select Nokia phones, but the service was discontinued by 2009.

NOKIA
N-GAGE

Tapwave Zodiac

2003

Launch price: $299 (32 MB), $399 (128 MB)	**Systems sold:** 50,000+ (est.)
CPU: Motorola ARM9 at 200 MHz	**RAM:** 32 or 128 MB **VRAM:** 8 MB
Resolution: 480×320 pixels	**Games released:** 40+

The Zodiac was a high-end, adult-oriented handheld console that was released by Tapwave in late 2003. Based on Palm OS, the operating system that ran personal digital assistants (PDAs), the Zodiac was a hybrid device that combined a gaming handheld with PDA functionality. Press and reviews were positive at launch, as critics praised the handheld's large color screen and multimedia capabilities. However, the Zodiac suffered from niche appeal, poor retail presence, and low consumer awareness. When Sony unveiled its PSP in 2004, interest in the Zodiac as a game platform greatly diminished, and Tapwave discontinued the handheld in mid-2005.

The Zodiac had a small library of exclusive titles and could also play Palm OS 5 applications and games.

XaviXPORT

2004

Launch price: $79	**Systems sold:** Unknown
Processor: Custom SuperXaviX (on cartridge)	**RAM:** N/A
Controllers: Bowling ball, bat, racket, fishing rod	**Games released:** 10+

The XaviXPORT was a console based on motion-controlled sports games that was released two years before Nintendo's *Wii Sports* popularized the idea. The XaviXPORT used infrared motion tracking and wireless controllers shaped like real sports equipment to create physically interactive living-room versions of tennis, bowling, boxing, fishing, and baseball. Though it followed the same general idea as *Wii Sports*, the XaviXPORT's games were only 2D and its motion controls were much less accurate. Due to low retail presence and limited marketing from its Japanese creator, SSD Company Limited, the system went by largely unnoticed.

The XaviXPORT had an optional weight scale that tracked a user's weight loss and offered exercise routines.

VTech V.Smile

2004

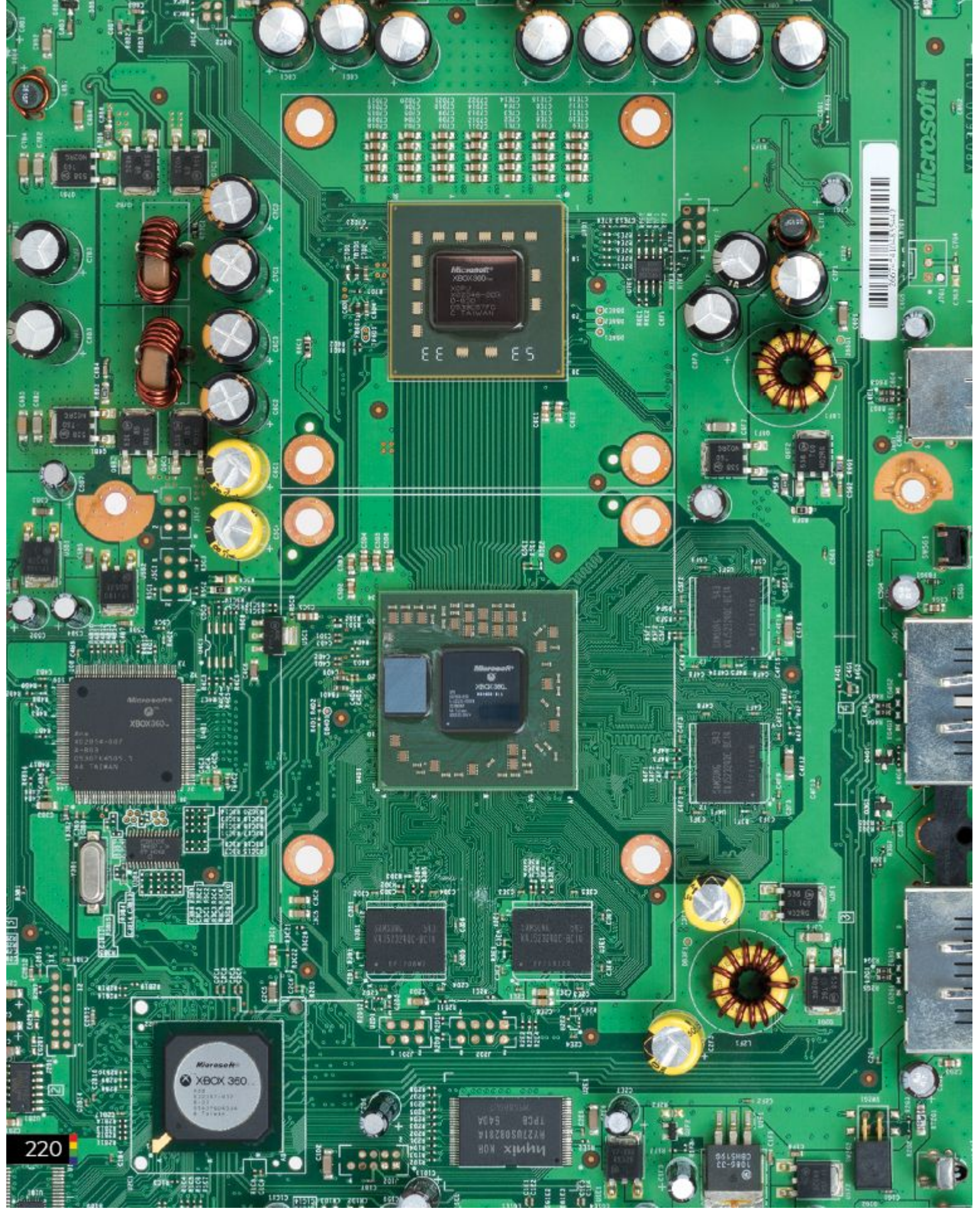
Launch price: $59	**Systems sold:** 4+ million (all models; est.)
Processor: Suntech SPG2XX	**RAM:** N/A
Alt models: Pocket, Cyber Pocket, Baby, PC Pal	**Games released:** 70+

The V.Smile was an edutainment console from VTech, an electronics manufacturer known for learning toys, phones, and the 1988 Socrates. Rounded and colorful, the V.Smile system appealed to parents looking to give their young kids a cheaper and safer console than the more grown-up PlayStation 2 or Xbox. It featured simple, inexpensive games with basic gameplay, cartoony 2D graphics, and educational elements such as counting and spelling. The series was popular enough that the V.Smile line was expanded with variant consoles, including the portable V.Smile Pocket series in 2005 and the motion-controller-based V-Motion in 2008.

The top of the V.Smile contains a storage compartment for holding extra game cartridges.

V.Smile V-Motion

In 2008, Vtech released the V-Motion, an updated V.Smile with a new case design and a motion-sensing controller. The system came packaged with *Action Mania*, a collection of minigames all based on motion controls. These motion controls were limited, however, and mainly used controller tilting to move a character left or right onscreen. The V-Motion also included the new VLink port, which accepted a special USB stick that could save scores and transfer them to a computer. The VLink also worked in conjunction with the official VTech V.Smile website to unlock bonus, Flash-based web browser games.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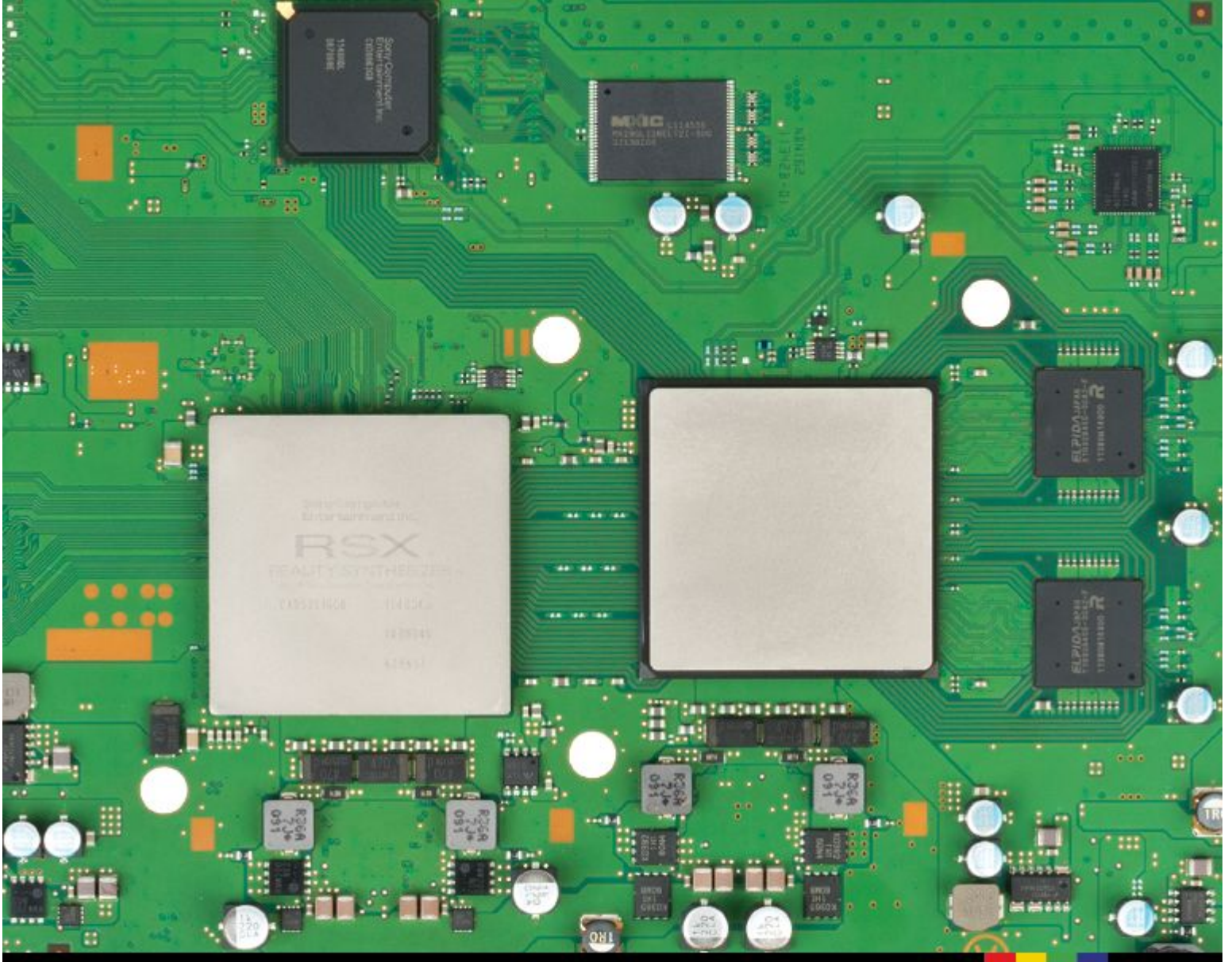

Seventh Generation

The seventh generation of consoles was dominated by just three major players—Microsoft, Sony, and Nintendo—as gaming moved into the high-definition, online era. Cutting-edge, multicore processors in Sony's and Microsoft's consoles offered impressive graphics on new HD televisions, while Nintendo found incredible success with an unorthodox, motion-controlled console and a dual-screened handheld.

The world became more connected with the widespread adoption of high-speed internet, which brought online gaming, digital distribution, and media streaming to the forefront. In addition, the introduction of touchscreen-based smartphones and tablets radically changed the gaming landscape, which created a new platform that introduced a much wider and more diverse audience to the world of video games.

PlayStation 3 Slim motherboard (above), Xbox 360 motherboard (opposite)

PlayStation Portable

2004

Launch price: $249	**Systems sold:** 80+ million
CPU: MIPS R4000 at 222 MHz (up to 333 MHz)	**RAM:** 32 MB (64 MB in later models)
Resolution: 480×272 pixels	**Games released:** 1,500+

The PlayStation Portable (PSP) was Sony's first handheld game console. The high-end device offered advanced 3D graphics, web browsing, and multimedia playback. With powerful custom processors and a miniature optical drive with discs that held up to 1.8 GB of data, the capabilities of the PSP were a massive leap compared to previous handheld systems. The PSP's game library was filled with exclusive, portable versions of popular console games as well as classic PS1 titles via emulation. The strength of the PlayStation brand and its range of games made the versatile handheld a success for Sony, which sold more than 80 million systems worldwide.

PSP games and media could also be stored on internal memory cards, with digital content available through a dedicated online store.

PSP Go

The PSP Go was a 2009 variant model that removed the optical drive in favor of 16 GB of internal flash memory. While digital-only devices are common today, the PSP Go was seen as too limited to many consumers at launch, as it was more expensive and less versatile than a regular PSP. After lackluster sales, the PSP Go was discontinued in 2011.

Nintendo DS

2004

Launch price: $149	**Systems sold:** 154+ million
Processors: Dual ARM7 and ARM9	**RAM:** 4 MB (16 MB on DSi and DSi XL)
Resolution: Two 256×192 pixel screens	**Games released:** 2,000+

Nintendo's Game Boy Advance was just two years old when Sony unveiled its upcoming PlayStation Portable, and the announcement put pressure on Nintendo to compete with its own advanced, 3D handheld. Nintendo responded with the DS: a dual-screened system that, while not as powerful as the PSP, was cheaper and had an intriguing design that featured a stylus-based touchscreen. The system drew in a large audience of casual gamers, who enjoyed unique titles such as *Brain Age* and *Nintendogs* as well as Nintendo exclusives like *Pokémon*. The DS was an unexpected smash hit and would become Nintendo's best-selling system of all time.

The DS and DS Lite both had a second cartridge slot that provided backward compatibility with Game Boy Advance games.

X
Y
A
B
START
SELECT

DS Lite and DSi Models

In 2006, Nintendo replaced the original DS with the slimmer, lighter, and brighter DS Lite (previous page). The DS series was updated again in 2008 with the release of the DSi (right), which added a faster processor, more RAM, 256 MB of internal memory, an SD card slot, two cameras, and its own online game store. The final DS model was the 2009 DSi XL (top, in green), a super-sized model with larger screens.

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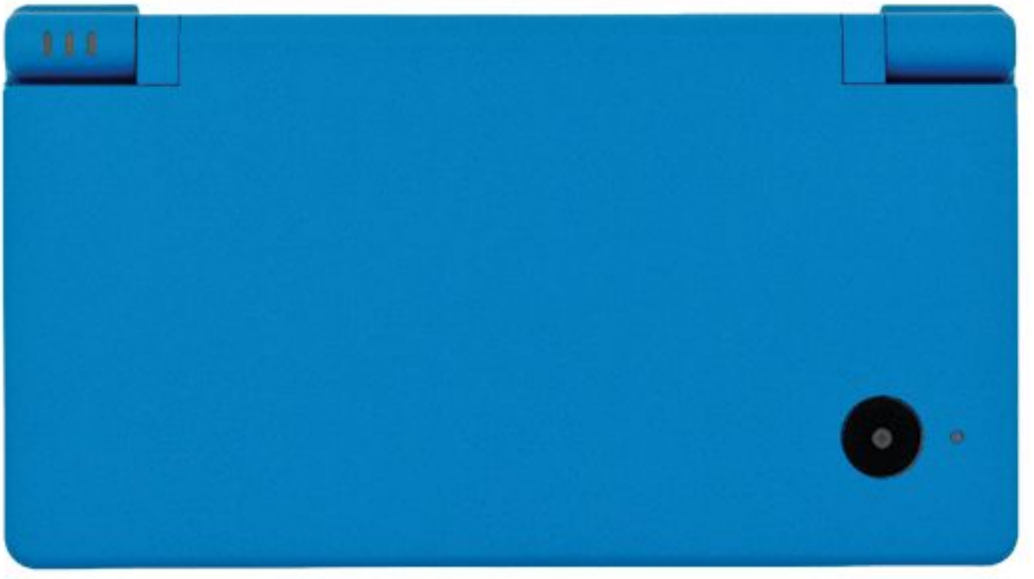


Gizmondo

2005

Launch price: $399	**Systems sold:** 25,000 (est.)
CPU: Samsung ARM9 at 400 MHz	**RAM:** 64 MB
Resolution: 320×240 pixels	**Games released:** 14

The Gizmondo was a Windows CE–based handheld system that was developed by Tiger Telematics (not to be confused with Tiger Electronics). Advertised with the slogan "I can do anything," the Gizmondo had advanced nongame functions such as GPS tracking, a built-in VGA camera, web browsing, and multimedia playback.

The expensive system had limited retail availability, however, and was mainly sold through mall kiosks and a single flagship store in London. The handheld's low sales, estimated to be around 25,000 units in total, contributed to Tiger Telematics declaring bankruptcy just a few months after the Gizmondo's debut.

The Gizmondo could send and receive SMS text messages but could not make or receive phone calls.

Game Wave

2005

Launch price: $99	**Systems sold:** 50,000–70,000 (est.)
Processor: Mediamatics 8611	**RAM:** 16 MB
Co-processor: Altera CPLD	**Games released:** 13

The Game Wave was a game console and DVD player hybrid created by ZAPiT Games. The Game Wave—more DVD player than console—used a low-power processor that limited gameplay to static, menu-based screens and pre-rendered video sequences. The system used this setup to play simple multiplayer-focused trivia, casino, and puzzle games aimed toward the casual and family-friendly crowd. Players used controllers shaped like TV remotes, and the Game Wave supported up to six users at once. The console was not a great seller and suffered from limited marketing and low retail presence, which led ZAPiT to abandon the Game Wave in 2009.

The Game Wave is the only game console to have been developed in Canada.

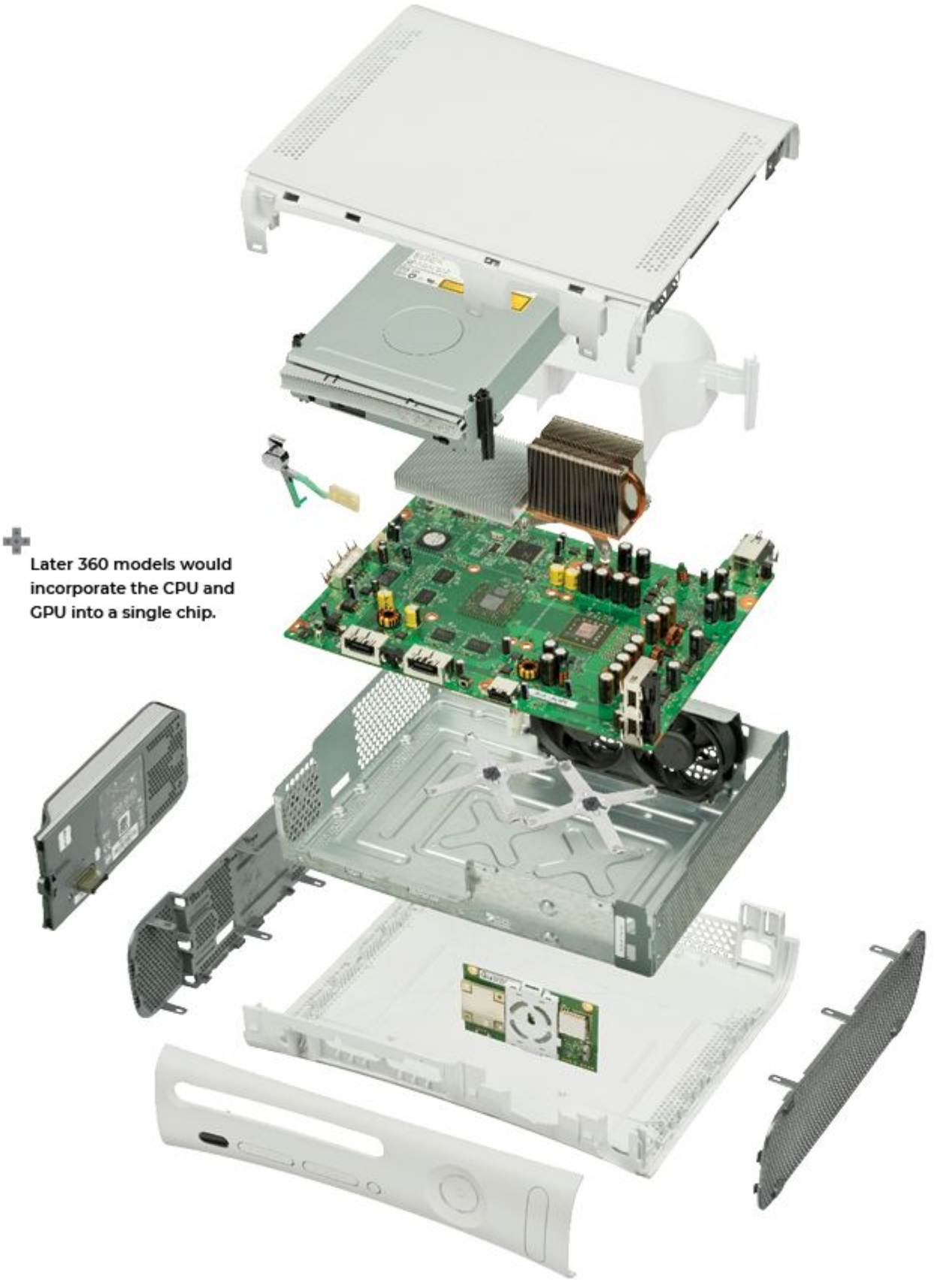
Xbox 360

2005

Launch price: $299 (no hard drive), $399 (20 GB)	**Systems sold:** 84+ million
CPU: Triple-core IBM "Xenon" at 3.2 GHz	**RAM:** 512 MB
GPU: ATI "Xenos" at 500 MHz	**Games released:** 2,000+

Microsoft pushed console gaming into a new era with the Xbox 360, a system whose HD graphics rivaled high-end PCs at the time of its release. Designed for the broadband age, the 360 focused heavily on online gaming and redefined the modern console with new features such as a digital marketplace and in-game achievements. With a year's lead, a lower price, and generally better multiplatform game performance than the PlayStation 3, the 360 established Microsoft as a major contender that could go toe to toe with Sony. The console would sell more than 84 million units worldwide and become Microsoft's best-selling system of all time.

Early 360s frequently suffered hardware issues that led to system failure, with bricked consoles displaying the infamous "red ring of death."



Later 360 models would incorporate the CPU and GPU into a single chip.

Xbox 360 Models and Revisions

Released in 2007, the Xbox Elite had a 120 GB hard drive and added an HDMI port that became standard on subsequent models; this version sold for a premium at $479.

The Xbox 360 S was a lighter and more power-efficient redesign from 2010 that added built-in Wi-Fi support.

The 2013 "E" model was a cosmetic redesign of the S that paired with the newly announced Xbox One console.

The Xbox 360 HD DVD drive retailed for $199 and came with a remote and an HD DVD copy of *King Kong* (2005).

HD DVD Drive

A new format war began in 2006 with the introduction of HD DVD and Blu-ray, each a high-density optical disc standard capable of storing both data and high-definition movies. Sony backed Blu-ray and used the format for its PlayStation 3, while Microsoft backed HD DVD and released an external drive for movie playback on the Xbox 360. The HD DVD drive was discontinued in 2008, however, when Blu-ray won the format war and the HD DVD standard was abandoned.

Kinect

The Kinect was a motion-based controller for the 360 released in 2010. The device used an array of cameras and sensors to track a player's body and translate their movements to onscreen actions. It found popularity with casual party games such as the *Just Dance* series, but efforts to incorporate the controller into core games were largely unsuccessful. As the Kinect's novelty faded, so did game and developer support, and despite a second push with an updated model for the new Xbox One in 2013 (page 309), Microsoft officially ended the Kinect line in 2017.

The Kinect launched with the new 360 S remodel, which included a dedicated Kinect connector port.

With USB and native Windows support, the wired version of the 360 controller was popular for PC gaming.

HyperScan

2006

Launch price: $69	**Systems sold:** 20,000–30,000 (est.)
Processor: Sunplus SPG290	**RAM:** 16 MB
Colors: 65,536	**Games released:** 5

The HyperScan was an inexpensive game console for kids from American toymaker Mattel—the company's first system since the Intellivison. The HyperScan's games relied on collectible cards embedded with RFID chips that sold in booster packs of six for $9.99. These cards, when scanned into the console, unlocked game content such as characters and abilities. Though the idea was innovative, the HyperScan suffered from outdated 2D graphics and a small library of awful, clunky games. The HyperScan flopped hard at release, and the console was discontinued and dumped into clearance bins after only a few months.

The HyperScan's games aggressively locked content behind collectible cards to encourage buying booster packs; one fighting game shipped with 18 of its 20 characters locked behind optional card purchases.

VTech V.Flash

2006

Launch price: $99	**Systems sold:** 60,000–80,000 (est.)
CPU: LSI Logic Zevio 1020 ARM9 at 150 MHz	**RAM:** 16 MB
GPU: Custom LSI Logic graphics core at 75 MHz	**Games released:** 9

Two years after the release of the V.Smile children's console, VTech expanded its edutainment lineup with the V.Flash. Aimed at the slightly older 6- to 10-year-old demographic, the V.Flash offered non-violent and educational 3D games with graphics similar to the original Sony PlayStation. Each disk included a standard game mode, an educational mode, and an artistic creative mode, with games based on properties such as *SpongeBob SquarePants* and Pixar's *Cars*. However, the system was not as successful as VTech's V.Smile line, and the V.Flash was discontinued after the release of just nine games.

The V.Flash was jointly developed by VTech and Koto Laboratory, the designer of the WonderSwan handheld.

PlayStation 3

2006

Launch price: $499 (20 GB), $599 (60 GB)	**Systems sold:** 80+ million
CPU: Custom "Cell" at 3.2 GHz	**RAM:** 256 MB **VRAM:** 256 MB
GPU: Custom "Reality Synthesizer" at 530 MHz	**Games released:** 2,200+

The success of Sony's PlayStation line led to notable excitement for its next system, the PlayStation 3, but many consumers were put off by its high launch price. The system's cost—$599 for the most expensive model—was the result of a feature-packed design that included an expensive Blu-ray drive and Cell processor. Production issues, strong competition, and lower-than-expected demand led the PS3 to a shaky first year of sales, but as assembly costs dropped, corresponding price cuts helped the system rebuild momentum. The console battled neck and neck with the Xbox 360 for second place in console sales—with the Wii topping the list—and would finish strong with more than 80 million systems sold worldwide.

The $599 launch model offered native backward compatibility through dedicated hardware.

SONY
SELECT
START

PlayStation 3 Models and Revisions

The original PlayStation 3 (later referred to as the "phat" or "fat") was bulky, heavy, and expensive. Later models dropped built-in features such as PS2 backward compatibility and memory card readers to keep costs down, while new redesigns reduced size and weight. The final PS3 redesign, the Super Slim model, further reduced costs with a cheaper top-loading Blu-ray drive.

A reduction in weight, size, and assembly costs allowed the PS3 Slim to release at just $299.

The 2012 Super Slim model sold with either a 250 or 500 GB hard drive or 12 GB of built-in flash memory.

The PS3's Cell processor was powerful, but many developers struggled with its architecture.

PlayStation Move

The PlayStation Move was a motion-based controller platform for the PS3 that was released in 2010. The PS Move's ball-tipped "wand" controller used various sensors and an external camera to track its position in 3D space, which made it more precise than Nintendo's Wii Remote. While praised by critics for its responsiveness, few games could meaningfully incorporate the PS Move into their design, and support for the platform waned over time. The PS Move would later get a second wind in 2016, when the controller was adapted for the PlayStation 4's virtual reality platform.

The PlayStation Move's flagship game was *Sports Champions*, a not-so-subtle take on *Wii Sports*.

One of the best uses of the PS Move was as a light gun; optional attachments could transform the Move into a pistol or a rifle.

Nintendo Wii

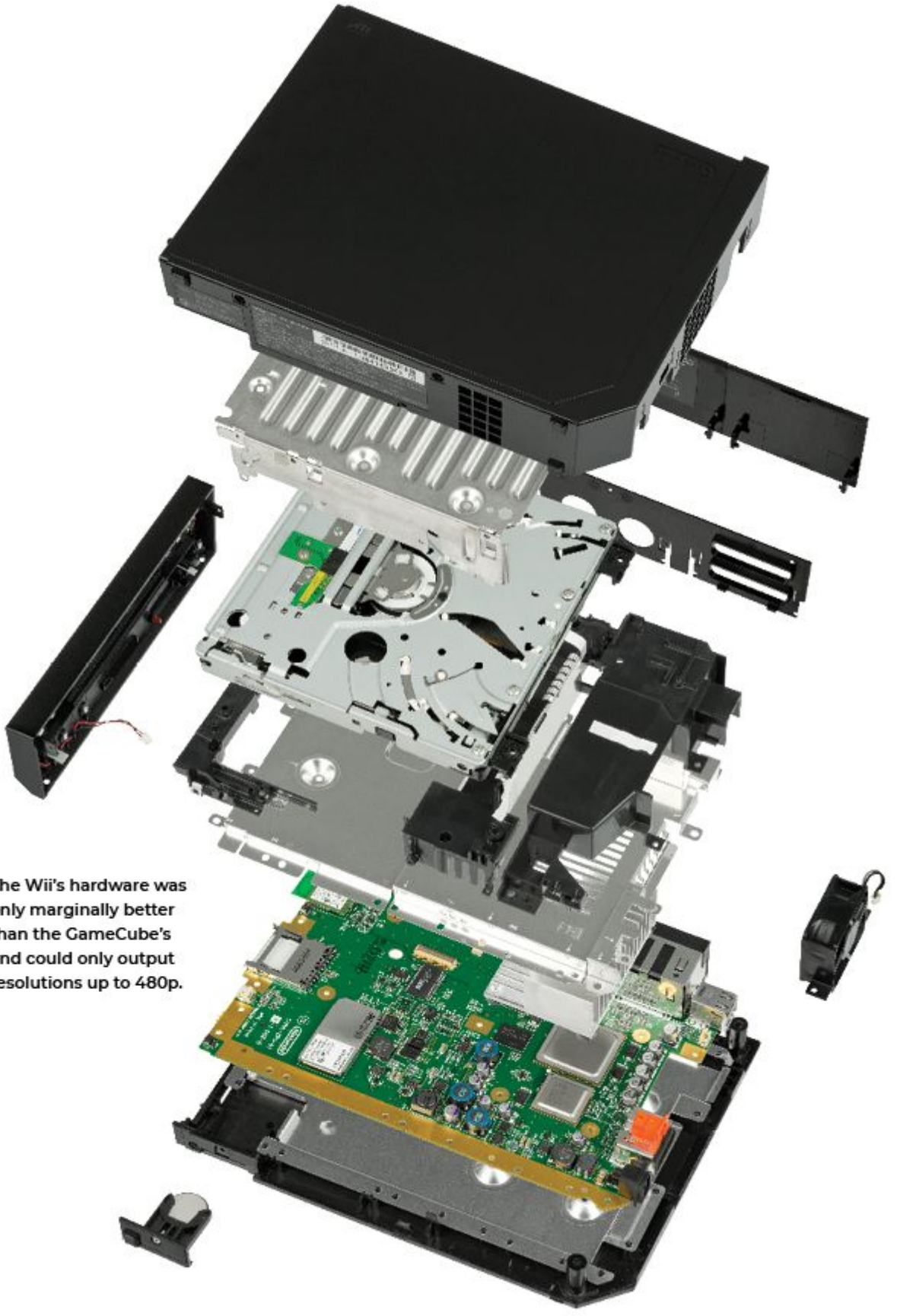
2006

Launch price: $249	**Systems sold:** 100+ million
CPU: Custom PowerPC "Broadway" at 729 MHz	**RAM:** 88 MB
GPU: Custom ATI "Hollywood" at 243 MHz	**Games released:** 1,500+

In the seventh game console generation, Nintendo abandoned direct competition with Microsoft's and Sony's systems and instead released the Wii: a non-HD console that focused on casual gaming. Based around a unique, remote-shaped controller that tracked motion, the Wii encouraged gamers to play with physical movement.

Its pack-in game, *Wii Sports*, used the controller to mimic activities such as bowling and tennis, and the title became a hit with gamers and nongamers alike. *Wii Sports* began a phenomenon that widely expanded Nintendo's audience and provided Nintendo with its best-selling home console ever.

The Wii's Virtual Console offered digital versions of games from the NES, SNES, and N64 eras.

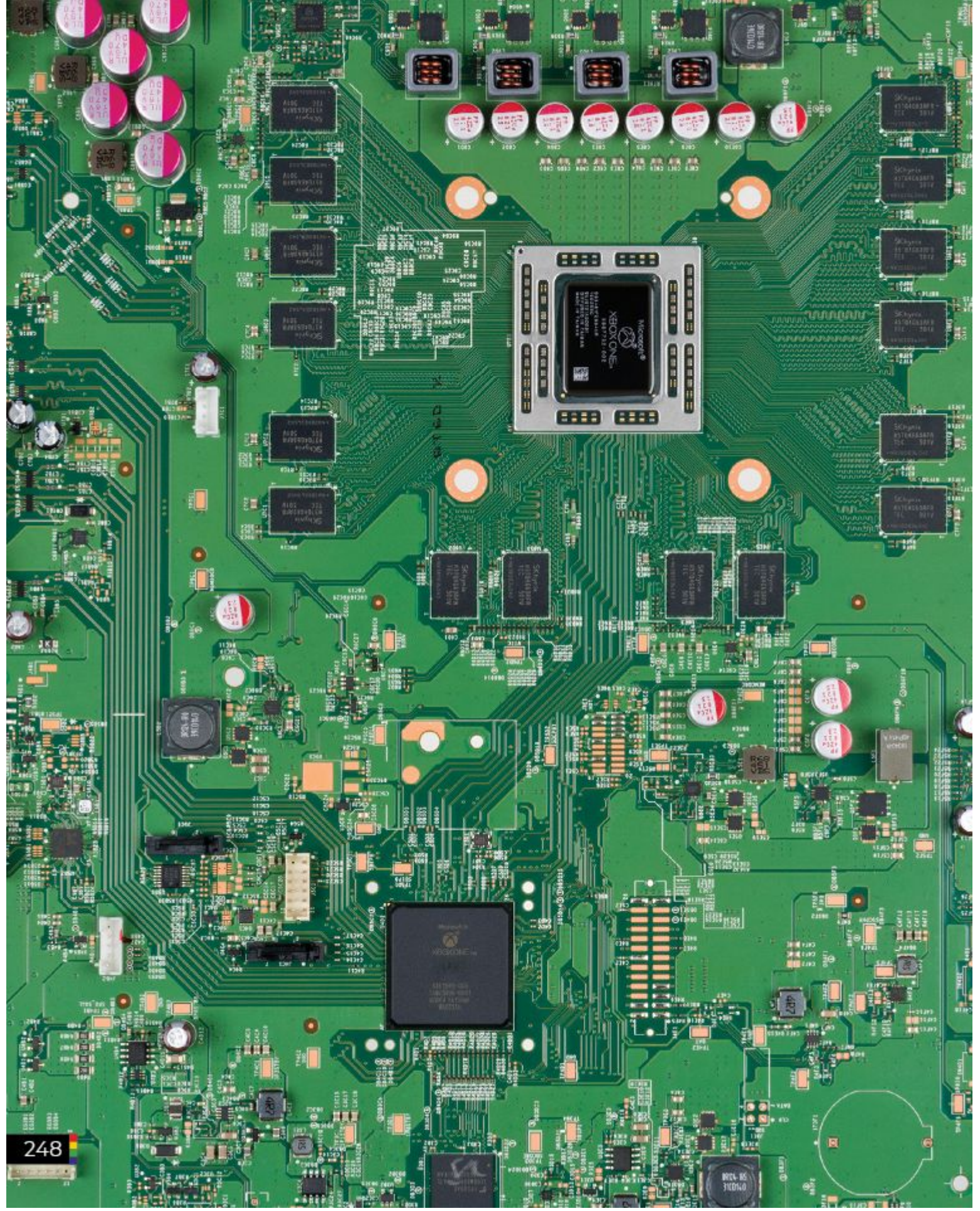


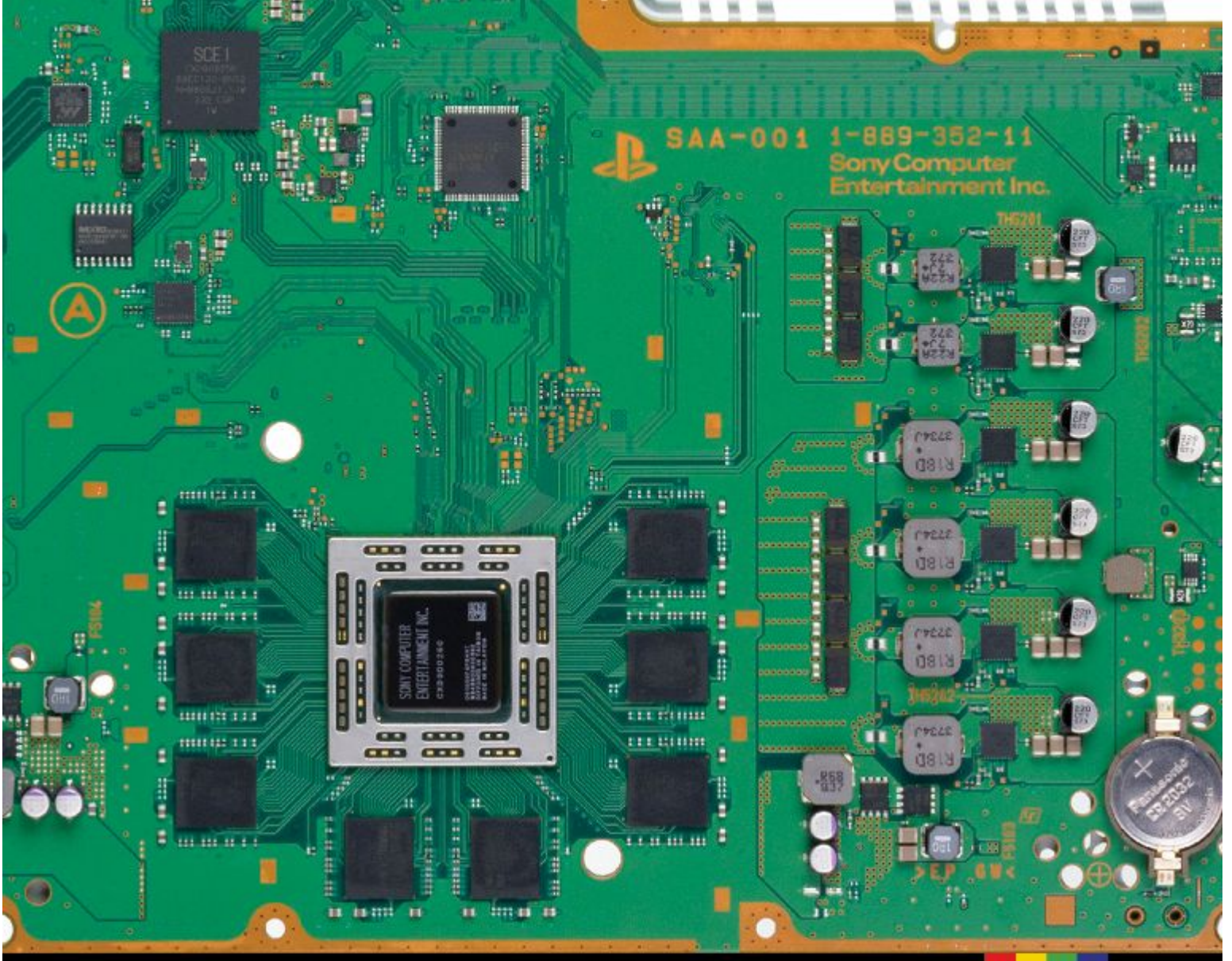
The Wii's hardware was only marginally better than the GameCube's and could only output resolutions up to 480p.

Wii Remote

The Wii Remote's nontraditional design set it apart from other console controllers, and its similarity to a TV remote made it easy for nongamers to try the system. An expansion port on the controller's base could attach to a "nunchuck" controller (below) for most games or to a traditional controller that was required for many Virtual Console titles.

The Wii Remote used an infrared sensor and accelerometers to track a user's movement; later Motion Plus models added a built-in gyroscope to improve tracking accuracy.


Microsoft
XBOX ONE



Eighth Generation

After a long and prosperous seventh gen, the eighth console generation saw large shifts and changes of fortune as multiple companies made major errors introducing new consoles. Microsoft stumbled out the gate with a disastrous Xbox One prelaunch, which halted the momentum it had built with the 360. Nintendo, flush with the success of the Wii, saw its market share plummet due to poor Wii U sales.

Nintendo's 3DS also had a rough start, but price cuts and a variety of new models rebuilt the handheld into a success. Sony was able to retake its role as the market leader with the popular PlayStation 4, though its new Vita portable floundered. Finally, smartphone technology gave rise to "microconsoles," a series of small TV boxes that attempted and failed to bring mobile gaming to the television.

PlayStation 4 motherboard (above), Xbox One motherboard (opposite)

Apple iOS

2007

iPhone launch price: $499 (4 GB), $599 (8 GB)	**Active iPhone users:** 1+ billion
Processor: Custom Apple ARM SoC (modern)	**iOS apps available:** 3.4+ million (est.)
App Store launch: July 10, 2008	**iOS games available:** 900,000+ (est.)

Apple unveiled the first iPhone in 2007, a revolutionary touchscreen-based smartphone powered by its new iPhone OS (later iOS) mobile operating system. The next year Apple introduced the App Store, which opened the iPhone to third-party games and applications. The new platform received massive attention, launching an era of casual, touch-based mobile games. The number of mobile games grew exponentially in a short amount of time, as smartphones became ubiquitous and reached an install base that dwarfed that of consoles. This market continues to grow today, and it has eclipsed both PC and console gaming in total revenue.

Apple made a big push for gaming with iOS 13, which offered native support for a variety of Bluetooth controllers.

Apple Arcade

As mobile gaming evolved, the market moved away from set-price games to one dominated by free-to-play games that generate revenue via in-app purchases and advertisements. In late 2019, Apple launched a gaming subscription service called Apple Arcade that removed many of these negatively viewed staples of mobile games. For a flat monthly fee, subscribers could play a variety of complete games that are free of microtransactions and pop-up advertisements across various Apple devices, including iPhones, Apple TVs, and Mac computers. The platform launched with more than 50 titles, many of which were funded by Apple and exclusive to the platform, while others were ports of console and PC games.

Google Android

2008

First Android device: T-Mobile G1	**Active Android users:** 2.5+ billion
Android flagship device: Google Pixel phones	**Google Play apps available:** 3 million
Android app store launch: October 22, 2008	**Google Play games available:** 350,000+

Android is an operating system developed by Google that is primarily used in mobile devices such as tablets and smartphones. Created as an open standard, the Android OS can either be run as stock or heavily customized into a closed system. This adaptability lured in manufacturers and helped Android to become the world's most popular phone OS, which also led to its adoption in devices such as smart TVs, media boxes, and microconsoles. The platform's app store, Google Play, offers numerous games (mostly touchscreen-based) as well as emulators for retro game consoles, which gives any device running Android massive gaming potential.

The T-Mobile G1 was the first Android-powered device. The smartphone sold for $179 with a two-year phone plan.

The Nexus Player was the last Nexus-branded device. As of 2016, Google releases flagship Android products under the "Pixel" branding.

Nexus Player

Google's Nexus line was a series of flagship products used to launch major updates of its Android operating system. In late 2014, Google released the Nexus Player, a TV media box that was the first product to use its new Android TV platform. The Nexus Player offered media playback from a variety of streaming apps such as Netflix, YouTube, Pluto TV, and Hulu. Games were also available from the Google Play store, but the selection was severely limited due to many games lacking controller support. Controller support for mobile games continues to be an issue to this day, as many titles are intended or built only for touchscreen controls.

Zeebo

2009

Launch price: R$499	**Systems sold:** 30,000
CPU: Qualcomm ARM11/QDSP-5 at 528 MHz	**RAM:** 128 MB
GPU: Qualcomm Adreno 130	**Games released:** 55+

The Zeebo was a console produced by the Brazilian toy and electronics manufacturer Tectoy for the South American and Mexican markets. Based on mobile-processor chips developed by Qualcomm, the Zeebo closely resembled a smartphone, complete with a 3G cellular antenna. The console used this wireless cellular connection for its digital marketplace, which was the only way to buy and download games for the console. Upon its release, the system struggled to make an impact on the South American gaming market, and its low sales led to large financial losses for Tectoy, which discontinued the Zeebo two years later.

Tectoy is most known in Brazil for producing and distributing Sega's Master System and Genesis consoles.

OnLive

2010

Launch price: $14.95 monthly fee (later free)	**Concurrent users (peak):** 1,600
Server CPU: Unknown	**Server RAM:** Unknown
Server GPU: Unknown	**Games released:** 200+

OnLive was a cloud gaming service that ran from 2010 to 2015 and allowed users to play PC games on a variety of devices. Games were stored and run on data center computers, and the gameplay was video-streamed back to users over the internet. Players could either access OnLive through an app on their computer, phone, or tablet, or they could use the official microconsole streaming box to play on a television. While the experience was very susceptible to lag and entirely dependent on a high-speed internet connection, OnLive could drop users into gameplay within seconds and offered PS3- and Xbox 360–level gaming on low-powered mobile devices.

OnLive's "Brag Clip" feature captured short gameplay videos for sharing, a feature later adopted by the PS4, Xbox One, and Nintendo Switch.

Nintendo 3DS

2011

Launch price: $249	**Systems sold:** 75+ million
CPU: Dual ARM11s at 268 MHz	**RAM:** 128 MB
Resolution: 400×240 (top), 320×240 (bottom)	**Games released:** 1,200+

The 3DS, Nintendo's successor to its DS handheld line, was a new system capable of displaying stereoscopic 3D without the use of 3D glasses. Despite the DS's previous success, the 3DS sputtered at launch, with slow sales that were attributed to the handheld's high price and a lack of interest in the system's 3D ability.

Nintendo responded with a drastic $80 price cut just months later, which, along with the release of flagship *Super Mario* and *Pokémon* titles, renewed interest and increased sales. While it didn't match the DS's massive sales figures, the 3DS proved traditional handheld gaming was still viable in the modern mobile age.

The Nintendo 3DS was backward compatible with the original DS.

X
Y
A
B

Nintendo 3DS Models and Variants

Nintendo released multiple models of the 3DS over its lifetime. Like the original DS, the series offered XL variants that had larger screens, and the "New" 3DS line offered multiple hardware improvements. The first two New models, the original (previous page) and the XL (above, top), featured a second analog stick, two extra shoulder buttons, improved stereoscopic 3D, and a faster processor. A few demanding 3DS games made use of the extra power, but less than 10 titles exclusively required a New model to play. The most unique variant was the 2DS (opposite), a square, fused-screen model aimed toward children that removed 3D support.

PlayStation Vita

2011

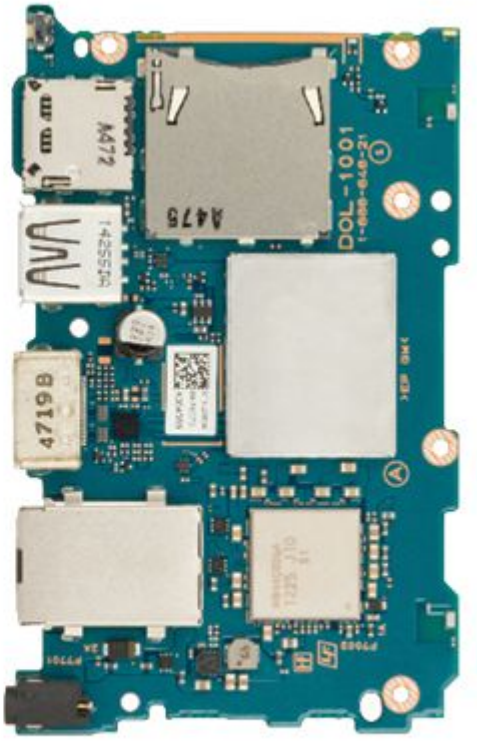
Launch price: $249 (Wi-Fi), $299 (3G/Wi-Fi)	**Systems sold:** 15+ million (est.)
CPU: Quad-core ARM Cortex A9	**RAM:** 512 MB **VRAM:** 128 MB
GPU: Quad-core PowerVR SGX543MP4+	**Games released:** 1,200+

The PlayStation Vita was an advanced, feature-packed handheld console from Sony that was the successor to the PSP. The Vita failed to match the success of the PSP, however, in part due to heavy competition from mobile devices that stole away casual and average gamers, leaving the Vita with narrow appeal. After sales slowed following the system's debut, official and AAA game support dwindled. The Vita became a niche console that was kept afloat by a dedicated user base that appreciated its library of Japanese RPGs, visual novels, and American indie games. Due to low sales, Sony stated that there were no plans for a successor.

The first Vita model used an OLED display that was well regarded for its high contrast and vibrant colors.

The Vita 2000 (above) was a slimmer and lighter redesign from 2013 that replaced the previous model's OLED screen with a standard LCD.

The PS TV (below) was a TV-box Vita variant released in 2013 that played a selection of Vita, PSP, and PS1 games on a television with a controller.



Wii U

2012

Launch price: $299 (8 GB), $349 (32 GB)	**Systems sold:** 13+ million
CPU: Custom IBM tri-core "Espresso" at 1.24 GHz	**RAM:** 2 GB
GPU: Custom AMD Radeon "Latte" at 550 MHz	**Games released:** 800+

The Wii U was Nintendo's first HD console and the successor to the hugely popular Wii. Built around a large, tablet-like controller with a built-in screen, the Wii U played games with or without a TV and offered the possibility of innovative, dual-screen gameplay. However, casual gamers who enjoyed the Wii ignored the Wii U and moved to mobile games. Average gamers were put off by the console's high price, poor online ecosystem, and lack of third-party support that led to months-long game droughts. Unable to attract a wide audience, sales stalled and never recovered, and Wii U support ended in 2017 with only 13 million consoles sold.

Poor marketing caused many consumers to believe the Wii U's controller was an add-on for the original Wii.

The Wii U was fully backward compatible with the original Wii.

In their first year of release, rare Amiibo created a frenzy on eBay, with some figurines selling for more than $100 each.

Amiibo

In 2014, Nintendo introduced Amiibo, a line of $13 to $16 figurines that featured characters from Nintendo and other various franchises. Each Amiibo's base contained a special chip that could be scanned when placed on a wireless sensor built into the Wii U GamePad controller. When scanned into a compatible game, the figurines unlocked in-game bonus content such as items and costumes. The Amiibo platform was also available on the 3DS and Nintendo Switch consoles.

The GamePad's built-in screen was a major selling point for the Wii U; however, many developers struggled to make use of the second display during gameplay.

Ouya

2013

Launch price: $99	**Systems sold:** 200,000
CPU: Quad-core ARM Cortex-A9 at 1.7 GHz	**RAM:** 1 GB DDR3
GPU: Nvidia GeForce at 520 MHz	**Games released:** 100+

The Ouya was an Android-based gaming microconsole brought to life through an $8.5 million Kickstarter crowdfunding campaign. Built from tablet and cell phone parts, the Ouya mostly played mobile game ports and offered a few exclusives through its dedicated online store. On its release, the system suffered from hardware and software issues, and was plagued by bad reviews and negative press. It sold poorly at retail, and very few of those who did buy the console actually bought games for it, instead using the Ouya for emulators and media playback. After its failure, the Ouya's assets were sold to the company Razer, and the console was discontinued in 2015.

Each Ouya also functioned as a dev system, meaning owners could use it to create their own games.

GameStick

2013

Launch price: $79	**Systems sold:** 20,000–30,000 (est.)
CPU: ARM Cortex A9 at 1.5 GHz	**RAM:** 1 GB DDR3
GPU: ARM Mali-400	**Games released:** 60+

The GameStick was an Android-powered gaming microconsole that, like the Ouya, began with a Kickstarter campaign. The company PlayJam successfully raised $650,000 in early 2013 and released the console later that year. The GameStick's reviews were tepid at launch, citing bugginess and a limited, locked-down online store mostly made of mobile game ports. The GameStick's hardware was also less capable than comparable Android-based systems, which made compatibility with future games uncertain. After dismal sales, retail stock was liquidated in 2014, and the GameStick's online game store closed permanently in early 2017.

The GameStick's small HDMI dongle was the actual brains of the system.

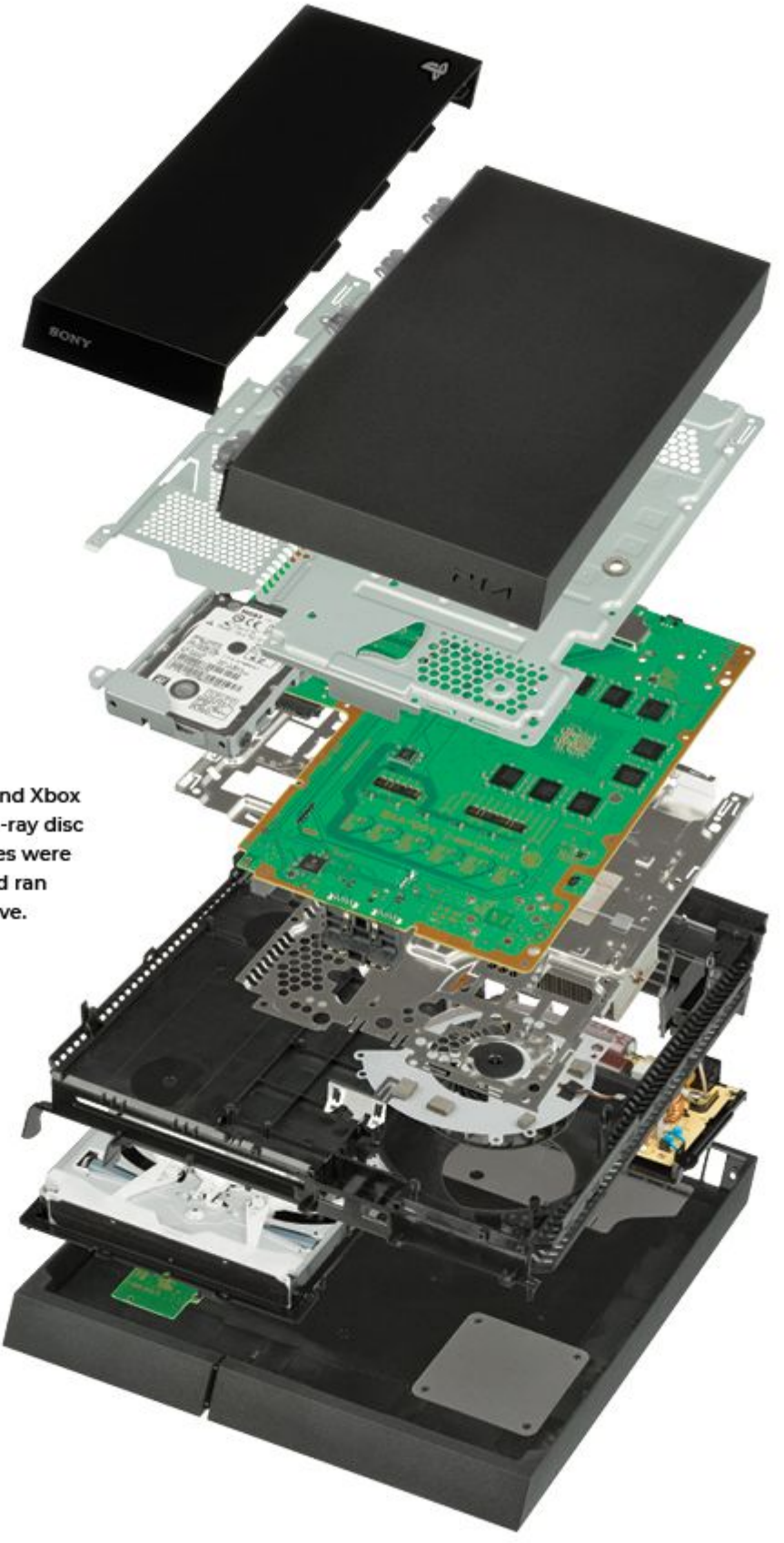
PlayStation 4

2013

Launch price: $399 (500 GB)	**Systems sold:** 105+ million
CPU: Custom 8-core AMD "Jaguar" at 1.6 GHz	**RAM:** 8 GB GDDR5
GPU: Custom AMD Radeon GCN at 800 MHz	**Games released:** 3,000+

The PlayStation 4 was Sony's long-awaited successor to the 2006 PS3. Learning from the PS3's rough start due to its complex architecture and high price, Sony built the PlayStation 4 to be more affordable and developer-friendly, pairing a straightforward design with a robust graphics processor and fast memory. The PS4 launched alongside the Xbox One, where it sold for $100 less and offered better performance in most games compared to Microsoft's console. The PS4 was an immediate hit for Sony, with gamers and developers flocking to the system. The PlayStation 4 would go on to greatly outsell the Xbox One and Wii U to become the generation's best-selling system.

Unlike the PS2 and PS3, the PS4 was not backward compatible.



Both the PS4 and Xbox One used a Blu-ray disc drive, but games were installed on and ran from a hard drive.

PlayStation 4 Pro

In 2016, Sony released an enthusiast PS4 model for $399 that offered enhanced gaming performance. Called the PS4 Pro, it had an overclocked CPU, faster RAM, and double the graphics processor cores of a standard PS4. The result was better-looking games with smoother framerates and higher resolutions in supported titles.

The PS4's DualShock 4 controller added a light bar, a touchpad, and a built-in speaker.

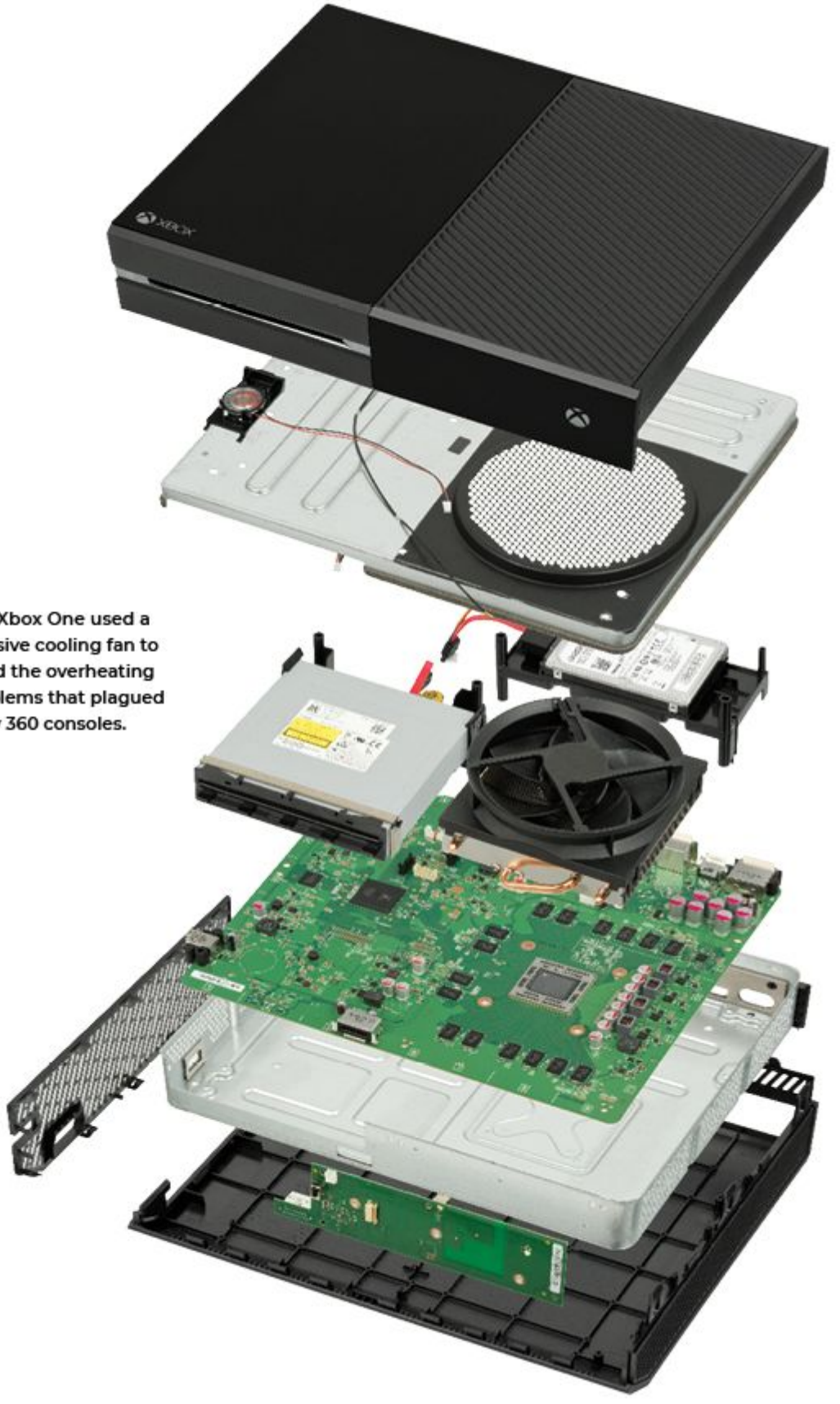
Xbox One

2013

Launch price: $499 (500 GB with Kinect)	**Systems sold:** 46 million (est.)
CPU: Custom 8-core AMD "Jaguar" at 1.75 GHz	**RAM:** 8 GB DDR3, 32 MB ESRAM
GPU: Custom AMD GCN at 853 MHz	**Games released:** 2,600+

The Xbox One was Microsoft's follow-up to its successful Xbox 360 console. Microsoft introduced the Xbox One as an all-in-one entertainment system that focused on live TV, media streaming, and social media just as much as gaming. The new direction, combined with confusing anti-consumer policies (such as a ban on used games, which was dropped before the launch), alienated gamers and took a heavy toll on the Xbox brand's popularity. While the Xbox One eventually regained lost ground in America with aggressive price drops and a renewed focus on gaming, the system never recovered abroad, where it was vastly outsold by the PlayStation 4.

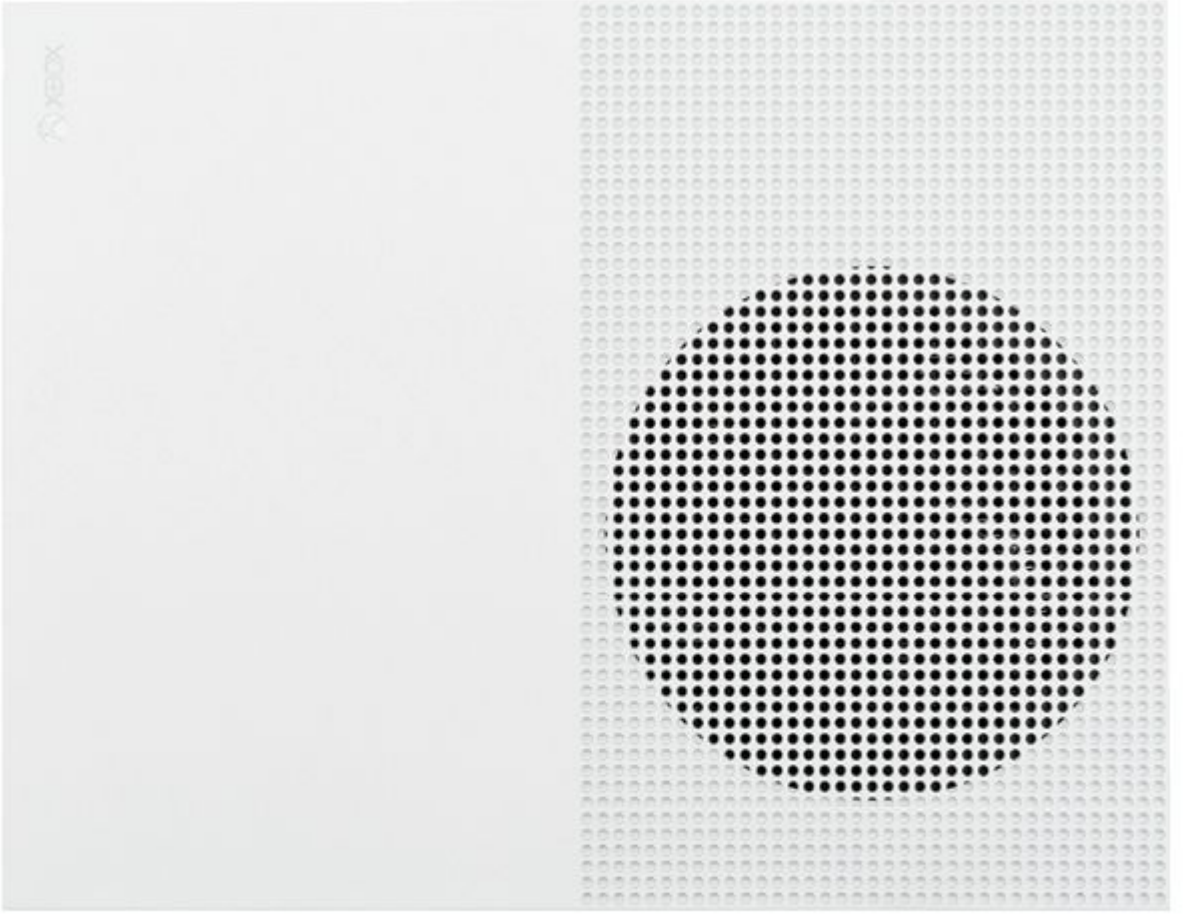
Like the PS4, the Xbox One used an AMD x86 processor and GPU, but it also included 32 MB of ultrafast ESRAM.



The Xbox One used a massive cooling fan to avoid the overheating problems that plagued early 360 consoles.

Xbox One S

In 2016, Microsoft replaced the standard Xbox One with the new "S" model. Forty percent smaller than the previous Xbox One, the S featured a handful of updates and improvements, such as an internal power supply and a built-in infrared blaster for controlling other electronics. Also included was 4K and HDR video support from either online streaming sources or its new and upgraded 4K UHD Blu-ray drive.



Microsoft invested more than $100 million into the design of the Xbox One controller.

Mad Catz MOJO

2013

Launch price: $249	**Systems sold:** 30,000–50,000 (est.)
CPU: Quad-core ARM Cortex-A15 at 1.8 GHz	**RAM:** 2 GB
GPU: Nvidia GeForce at 672 MHz	**Game libraries:** Google Play, Ouya, OnLive

The MOJO was an Android microconsole from Mad Catz, an electronics manufacturer that's best known for its third-party console controllers. At release, the MOJO was an upscale microconsole that used the powerful Tegra 4 processor and sold for more than twice its $100 competitors. While the system didn't have a dedicated game library, the MOJO had limited access to Android games from the Google Play store, which included a variety of emulators for classic game consoles. In 2014, Mad Catz expanded the MOJO's game library even further to include full compatibility with the Ouya platform as well as OnLive game streaming.

The MOJO controller's "mouse mode" toggle made it possible to play mobile touchscreen games on a TV, though many touchscreen games were not available to download on the MOJO.

Amazon Fire TV

2014

Launch price: $99 (controller sold separately)	**Systems sold:** 35+ million (all Fire products)
CPU: Quad-core Snapdragon 600 at 1.7 GHz	**RAM:** 2 GB
GPU: Qualcomm Adreno 320	**Games released:** 1,000+ (Fire TV only)

The Fire TV was a line of Android-powered TV boxes from the online retailer Amazon that streamed media, played games, and ran apps. At launch, Amazon promoted its Fire TV line as a gaming platform that could play a variety of mobile ports as well as Amazon-produced exclusive titles with an optional controller. However, support for controller-driven games quickly dried up, as Amazon diverted focus toward gaming on its more popular Fire tablet series. Unable to play these touchscreen-based games, the Fire TV line primarily became media streaming devices, and by 2017, references to gaming were dropped from the Fire TV's online product pages.

The Fire TV line was largely replaced by Amazon's Fire Stick platform, a less powerful and cheaper product that focused on media streaming.

Nvidia Shield TV

2015

Launch price: $199 (16 GB), $299 (500 GB)	**Systems sold:** 500,000+ (all models; est.)
CPU: 8-core ARM Cortex-A57 + Cortex-A53	**RAM:** 3 GB
GPU: 256 Nvidia Maxwell-based CUDA cores	**Games libraries:** Google Play, GeForce NOW

The Shield TV was a high-end, Android-based microconsole from Nvidia, a major graphics processor manufacturer. The Shield TV was part of Nvidia's Shield line of products that began in 2013 with the Shield Portable (a wireless controller with built-in mobile hardware and a flip-up screen), which was followed by the Shield Tablet in 2014. In 2015, Nvidia released the Shield TV, a powerhouse Android TV box and microconsole that was more gaming focused than other TV boxes available at the time. Thanks to the power of Nvidia's own X1 chip, the Shield TV could output 4K video, stream games from a computer, and play exclusive ports of console games.

The Nvidia Shield TV's Tegra X1 chip would later be used to power the Nintendo Switch console.

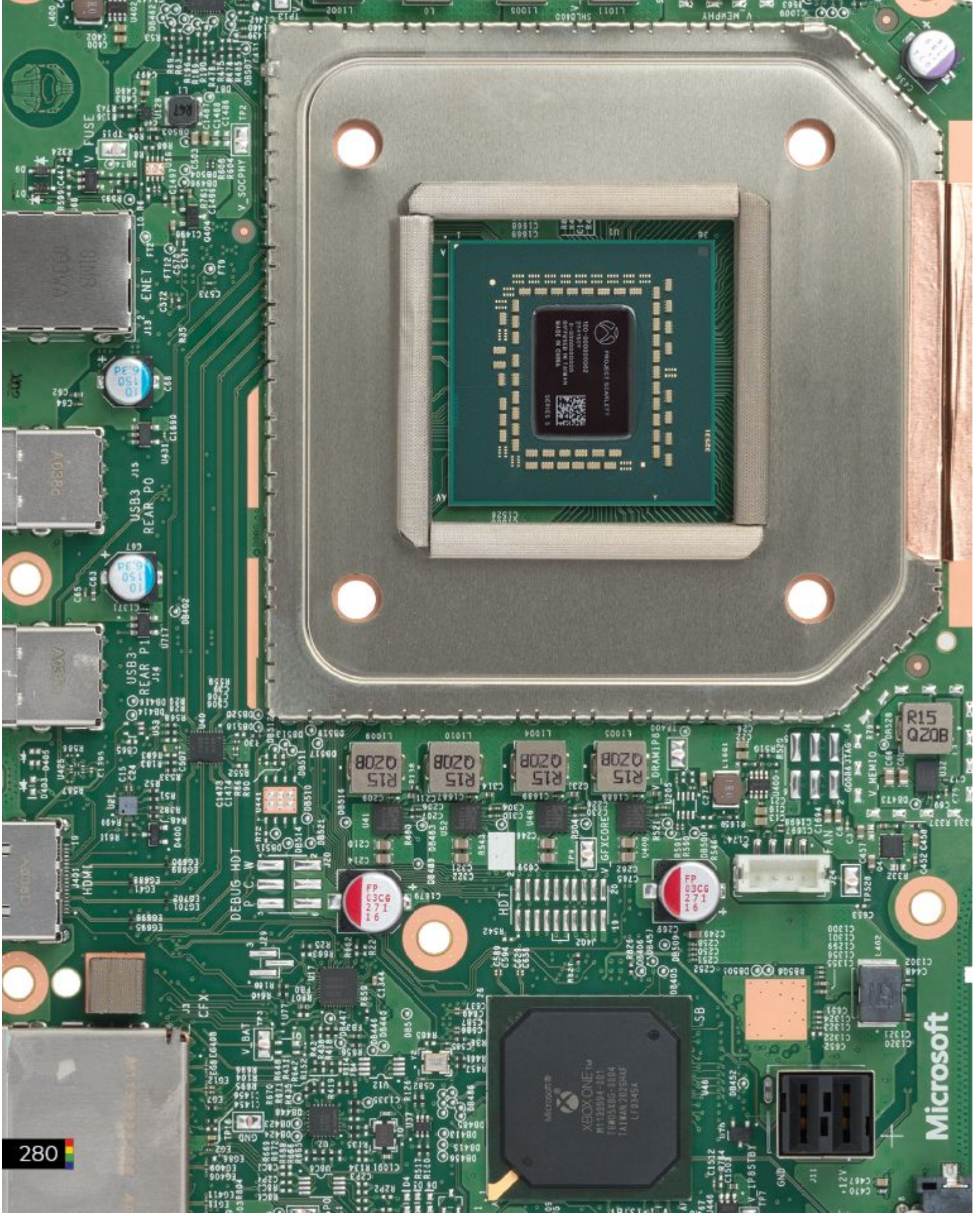
Steam Link

2015

Launch price: $49 (controller sold separately)	**Systems sold:** 2+ million (est.)
CPU: Marvell DE3005	**RAM:** 512 MB
GPU: Vivante GC1000	**Games released:** 30,000+ (all Steam games)

The Steam Link was a device from Valve that allowed users to stream games from their computer's Steam library to their TV. Steam, a digital distribution platform for computer games, was created by the game developer Valve in 2003 and is the world's largest computer games marketplace. The Steam Link was Valve's attempt to bring the couch experience of console gaming to the PC, and it worked with various wired and wireless console controllers as well as Valve's own Steam Controller. The unique and highly customizable controller used dual touchpads and gyroscope aiming to help translate the PC's couch-unfriendly mouse and keyboard setup to a controller.

Valve, the developer of the *Half-Life* series, originally created Steam to distribute its own PC games, but the service steadily grew to become the premier digital games marketplace.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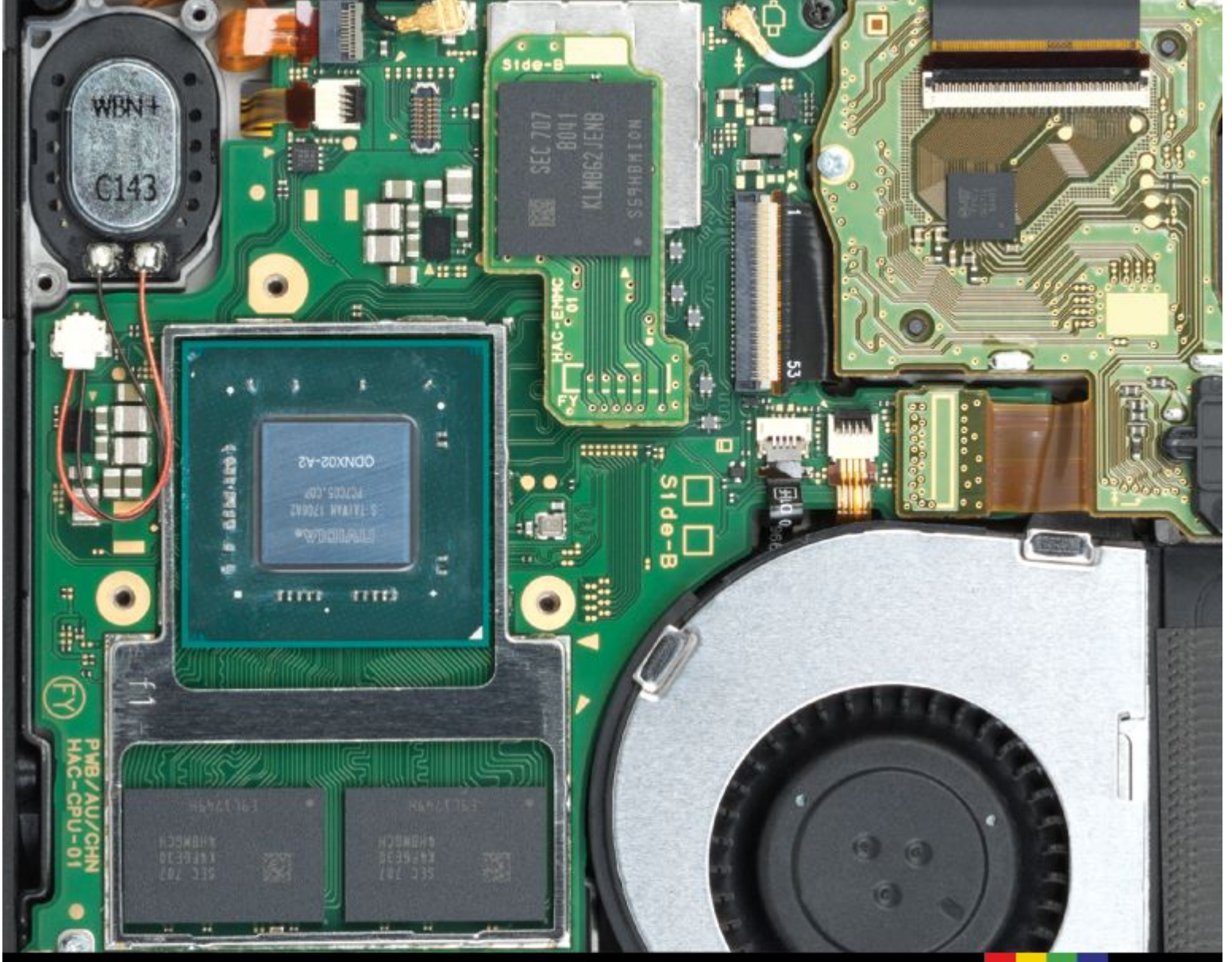


Ninth Generation

The COVID-19 global pandemic challenges humanity as the ninth console generation unfolds. With many stuck at home due to social distancing and quarantines, the popularity of video games has exploded as the bored and restless seek out escapism or ways to pass the time. While Nintendo's Switch successfully established itself prior to the pandemic, Sony's and Microsoft's consoles launched during lockdowns, and the systems instantly became must-have items. The limited production of gaming hardware, hampered by shutdowns, can't keep up with demand and ninth-gen consoles have become the target of scalpers. Unable to buy new systems at retail prices, many gamers are stuck with last-gen hardware while they wait until the world regains a sense of normalcy.

Nintendo Switch motherboard (above), Xbox Series S motherboard (opposite)

Nintendo Switch

2017

Launch price: $299 (32 GB)	**Systems sold:** 80+ million
CPU: 8-core ARM Cortex-A57 + Cortex-A53	**RAM:** 4 GB LPDDR4
GPU: 256 Nvidia Maxwell-based CUDA cores	**Games released:** 5,000+

The Nintendo Switch is a handheld and console hybrid that is the successor to both the Wii U and 3DS. Essentially a tablet with detachable controllers, the Switch is a dual system that offers console-level performance as a handheld device, or it can be played as a traditional TV console. This unique and flexible design grabbed consumer attention, which combined with an effective ad campaign to generate substantial prerelease hype. At launch, the system sold out quickly, and demand outpaced stock for months. The Switch became one of Nintendo's fastest-selling systems ever, managing to eclipse the Wii U's lifetime sales in less than a year.

When docked and played on a TV, the Switch runs in a high-performance mode that offers higher resolutions and framerates than handheld mode.

The Joy-Cons are small, detachable controllers with built-in batteries.

The Pro Controller is an optional purchase for players looking for a more traditional gaming controller.

Switch Lite

The Switch added to its lineup in 2019 with a new model, the Switch Lite, and saw the original Switch hardware receive a quality-of-life update. The new Lite is a smaller—but more limited—Switch variant built solely for handheld play. The Lite (below in yellow, shown with the original Switch) lacks removable controllers, rumble, and can no longer display out to a television, but it is $100 cheaper and more portable. The Lite's release coincided with an update of the original Switch that, while looking the same as the previous edition, uses a more efficient processor that results in a longer battery life. The updated model can now last five to nine hours on a full charge.

The Labo series includes a virtual reality kit that turns the Switch into a VR headset.

Nintendo Labo

Nintendo Labo is a line of cardboard construction sets built around the Switch and its Joy-Con controllers. Each set includes multiple pieces of large, flat cardboard with patterns cut into them that can be punched out and folded. Users take these pieces and construct various items such as a piano, fishing rod, steering wheel, or even a robot suit. The constructions work in tandem with the Joy-Cons, which slot in, and make heavy use of the controllers' IR camera, accelerometers, and gyroscopes to operate. Each Labo set comes with a game cartridge, and each cardboard construction has its own unique experience or game.

Google Stadia

2019

Launch price: $129 (Premiere Edition)	**User accounts:** 1.8 million (est.)
Server CPU: Custom x86 at 2.7 GHz	**Server RAM:** 16 GB
Server GPU: Custom AMD graphics processor	**Games on platform:** 150+

Stadia is a cloud gaming platform developed by Google that began in late 2019 and allows users to play games through multiple devices. Just like OnLive, users must download a mobile app or use a web browser to access Stadia, which receives a video stream of a game being run from a data center computer. For playing on a TV, a Chromecast Ultra streaming dongle is needed, which is included alongside an official controller in the Premiere Edition bundle. Users must buy games from a dedicated store, though Google does offer a monthly "Pro" subscription service that includes a small library of games as well as discounts for most titles.

In February 2021, Google closed the game studios it created for developing exclusive Stadia content, which cast heavy doubt on Stadia's future.

Oculus Quest

2019

Launch price: $399 (64 GB), $499 (128 GB)	**Systems sold:** 3+ million (Quest 1 and 2; est.)
CPU: Snapdragon 835 (Quest 1), XR2 (Quest 2)	**RAM:** 4 GB (Quest 1), 6 GB (Quest 2)
GPU: Adreno 540 (Quest 1), 650 (Quest 2)	**Games released:** 200+

Oculus is a virtual reality platform owned by the social media company Facebook and encompasses multiple VR headsets. Oculus' first commercial headset, the Rift (page 308), required the use of a powerful PC and external sensors to operate. In 2019, Oculus released the Quest, a fully stand-alone headset that had a built-in processor, battery, inside-out tracking, and a dedicated games store. Multiple cameras on the Quest headset scan the area around the player, tracking the players' hands (through the controllers) and the headset's location in 3D space. It was replaced by the updated Quest 2 in 2020, which features better specs and sells for $100 less.

When tethered with a USB-C cable to a PC, users can play PC VR games on their Quest.

Xbox Series X|S

2020

Launch price: $499 (X, 1 TB) $299 (S, 512 GB)	**Systems sold:** 6 million (est.)
CPU: Custom 8-core AMD Zen 2 at 3.8 GHz (X)	**RAM:** 16 GB GDDR6 (X), 10 GB GDDR6 (S)
GPU: Custom 8-core AMD RDNA 2 at 1.825 GHz (X)	**Games released:** 2,600+ (Xbox One compatible)

For its ninth-generation console, Microsoft left behind reinvention and instead built upon the eighth-generation Xbox One. Its new Series X|S platform is an evolution of the Xbox One architecture, now with a more powerful processor and superfast SSD storage. The Series X|S consoles use a new, custom-built AMD system on a chip (SoC) that includes hardware-accelerated ray tracing. The Series X (below) is a no-compromise system built for power whose beefier processor is rated at 12 teraflops (versus the Series S, rated at 4 teraflops). The Series X also remains quiet thanks to a vapor chamber heatsink and an efficient case design built around a single large fan.

The Series X|S are backward compatible with the Xbox One, and many last-gen titles play with improved performance and loading times.

If the 364 GB of useable storage on the Series S isn't enough, users can expand their Xbox with a Seagate 1 TB SSD card for $219.

Xbox Series S

The Xbox Series S is a budget, digital-only model that released alongside the Series X. Sold for just $299, Microsoft reduced the price of the Series S by cutting back on its hardware, which has no optical drive, a scaled-back GPU, and less RAM and SSD storage. Despite this, the CPU is nearly identical, which helps the Series S play games at close to the Series X's level, albeit at reduced resolutions. While its lack of an optical drive is limiting for consumers, digital-only devices such as the Series S are seen as desirable for console manufacturers, as the increased revenue from digital game sales (versus physical) can offset the loss usually taken on hardware.

PlayStation 5

2020

Launch price: $499 (w/ disc), $399 (digital only)	**Systems sold:** 8 million (est.)
CPU: Custom 8-core AMD Zen 2 up to 3.5 GHz	**RAM:** 16 GB GDDR6
GPU: Custom AMD RDNA 2 up to 2.23 GHz	**Games released:** 3,000+ (PS4 compatible)

The PlayStation 5 is Sony's ninth-gen game console. It offers 4K gaming and includes 825 GB of high-speed SSD storage. One of the largest consoles ever sold, the massive size of the PlayStation 5 is due to its robust cooling system, which was designed to be much quieter in comparison to the often-loud PS4. Powering—and heating up—the system is a custom-built, 10 teraflop AMD SoC with hardware-accelerated ray tracing support. The PlayStation 5's SoC is built using the same x86 architecture as the PS4, which allows for near complete backward compatibility with the PlayStation 4 and improved performance when playing most eighth-generation games.

The PlayStation 5 is sold with either a UHD Blu-ray drive or as a cheaper, all-digital discless version.

DualSense Controller

The PS5's DualSense controller is a major update over the DualShock 4 that adds new features and refinements. It retains the DualShock 4's touchpad and speaker but omits the rear lightbar in favor of an LED light ring around the touchpad. New features include a built-in microphone, USB-C charging, and updated triggers that have small, built-in motors offering adaptive resistance. The PS5 controller's rumble motors have also been updated to provide precise haptic feedback. Finally, every PlayStation 5 is preinstalled with *Astro's Playroom*, a small adventure game built around the DualSense's new features to showcase the controller's potential.

Bally
PROFESSIONAL
videocade
3002 FOOTBALL
SPORTS SERIES
XBOX ONE
Fallout 4 G.O.T.Y.
GAME OF THE YEAR EDITION
SUPER NINTENDO
SELECT
START
ATARI 2600
POLE POSITION
NINTENDO 3DS
Aladdin
SEGA
The Legend of
ZELDA
SONY
PlayStation
SELECT
START
BIOWARE
ATARI 5200
PAC-MAN
DONKEY KONG
XBOX ONE
HALO
THE MASTER CHIEF COLLECTION

Playing Retro Games Today

As technology advances and time goes on, vintage computers and consoles are at high risk of being left behind. Decades of age and wear have done considerable damage to some retro systems, leading to component failure that can render them unplayable. Other issues make it difficult to play aging consoles, such as the prevalence of digital flat-screen TVs, which often don't work well with the analog, low-resolution signals of older hardware. Luckily, small businesses, passionate individuals, and fan communities are building solutions to keep these old consoles alive. Whether you're a retro enthusiast who prefers gaming on original hardware or a curious newcomer wanting to play classic games using an emulator, there are more ways than ever to experience gaming's past and present.

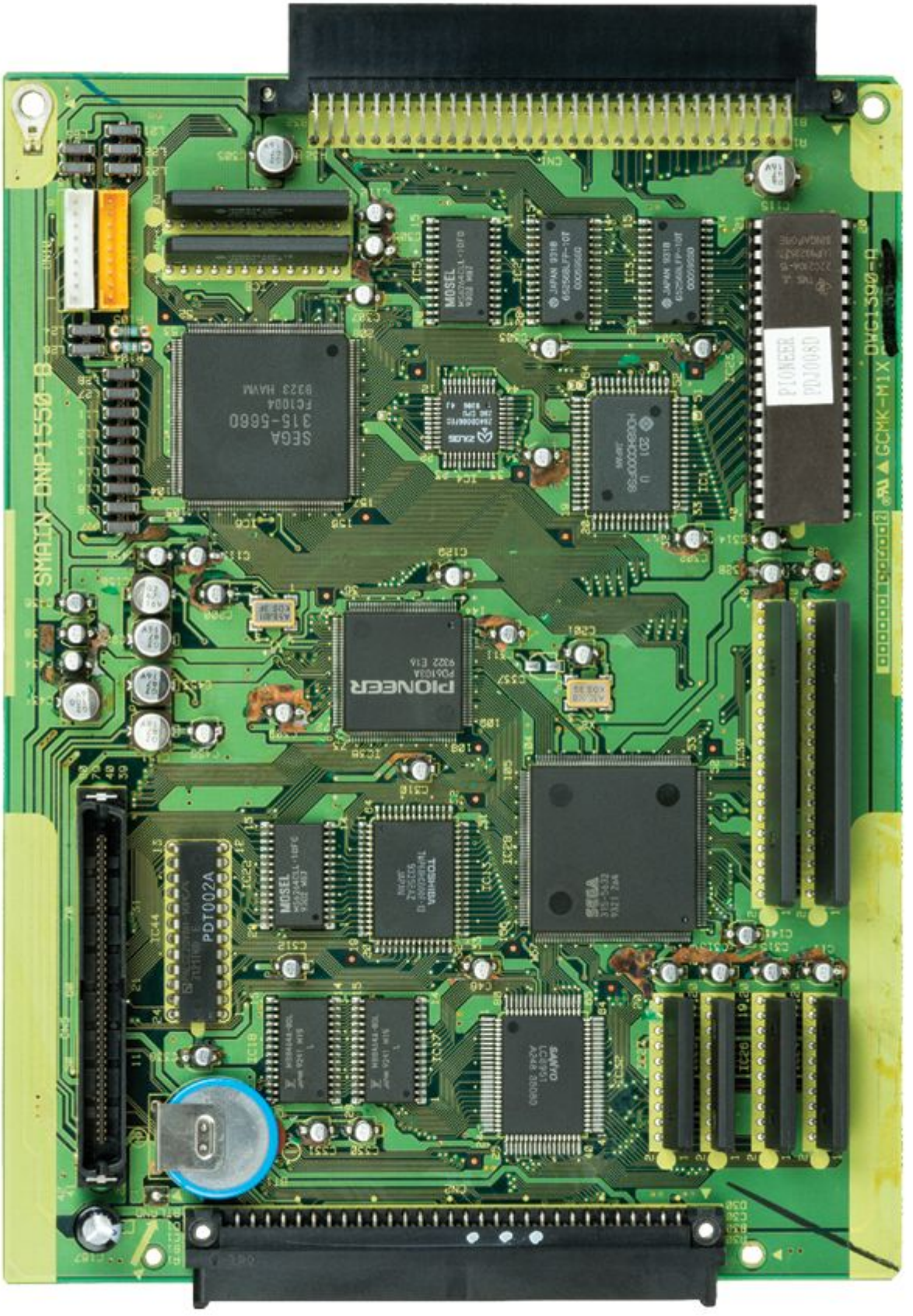
Hardware Failure

As game consoles and computers age, their long-term care and preservation becomes important. While components such as microprocessors and ROM chips can last for decades, other elements are at high risk for failure. Rubber, built-in batteries, capacitors, LCD screens, and motors are just some of the parts that have begun failing in vintage consoles.

While broken parts can be replaced, it's becoming harder and harder to source the unique components to repair these older and obscure consoles. The onus on keeping these systems alive has fallen to retro enthusiasts and hobbyists, some of whom have started their own businesses to service or produce the necessary parts to fix or emulate these ailing consoles.

A lithium battery (left) for the PSP that has swollen and no longer fits or works. Lithium batteries that have swollen can be very dangerous, as they can catch fire or even explode.

A broken Sega Genesis PAC for the Pioneer LaserActive (opposite). The LaserActive PACs used surface-mount capacitors that are notorious for failing and leaking acid. The damage (seen as brown spots) can make the board inoperable without extensive repair.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Mini and Classic Consoles

Mini and classic consoles are small, official reproductions of old systems that play on a modern TV through HDMI. The systems do not reproduce their console's original hardware but instead use inexpensive ARM processors to emulate the console with software. Powered by USB, games are built into the system with no ability to add additional titles (officially) or play games from their original cartridges or CDs. Mini consoles started as a trend in 2016 with the immense success of Nintendo's NES Classic, a $59 miniature NES that came with 30 built-in games. Multiple mini and classic consoles followed, with the Genesis, Atari 2600, PlayStation, TurboGrafx-16, Neo Geo AES, Commodore 64, and Super NES all getting official releases.

FPGA Hardware Emulation

A field programmable gate array (FPGA) is a chip that can be programmed to emulate multiple chips and circuitry at a hardware level. As FPGAs have gotten cheaper and more powerful, they've become tools for console preservation and are being used in devices such as optical drive emulators, EverDrives, and even console emulators.

The Mega Sg (shown below) is an FPGA-based console emulator created by Analogue, which uses original Sega Genesis cartridges and controllers. Outputting a pixel-perfect image through HDMI to a flat-screen TV, these new FPGA systems are one of the easiest ways to play original game cartidges on a modern television.

Optical Drive Emulators

Optical media greatly increased storage capacity and lowered manufacturing costs for video games, but as the format ages, issues with its reliability have been revealed. Optical drives in older consoles have become a major point of failure, rendering an otherwise operable system unusable. Early discs have shown issues as well, from laser rot to delamination, making preservation important. Recently, hardware enthusiasts have developed new FPGA-based optical drive emulators (ODEs) for these older systems, which play ripped game discs from SD cards or hard drives. The MODE by Terraonion (below, top right) is a drop-in ODE that replaces the optical drive for the Saturn, Dreamcast, or original PlayStation.

EverDrives

An EverDrive is a device for retro consoles that can store and play multiple game ROMs from a single game cartridge. Game ROMs are stored on SD or microSD cards, which can easily house an older console's entire game library. EverDrives are popular with retro enthusiasts who prefer to play on real hardware and want to avoid the increasingly expensive second-hand retro game market. Started as a home project by the Ukrainian hardware engineer Igor Golubovskiy (aka KRIKzz), the EverDrive line has grown to support multiple classic consoles. Some of the high-end EverDrives feature FPGAs that support save states and even optical drive emulation.

RGB, SCART, and Upscalers

Older game systems display video through analog signals that can be transmitted in a variety of ways. Most Americans are familar with composite video, where the entire video signal is compressed and sent over one yellow-tipped cable. For retro game systems, RGB offers the best quality, where the image is split into red, green, and blue signals. While many old consoles had RGB video output, almost no American TVs supported it. RGB was supported in Europe through SCART, a standard that carried a variety of video formats in one cable. SCART gained a new life for retro enthusiasts when external scalers became attainable, such as the Open-Source Scan Converter (OSSC) shown above, which accepts RGB over SCART and scales up the image for modern TVs. The result is a massive improvement over composite and worth looking into for anyone using original hardware on modern flat-screen TVs.

CRT TVs and PVMs

Before modern LCD and OLED flat-screen TVs became the norm, all home consoles were designed for and played on cathode-ray tube (CRT) televisions. These old TVs still have benefits over the average LCD TV, namely in response time, black levels, and the handling of analog, low-resolution signals. Many retro enthusiasts prefer to play their older game consoles on CRT TVs and herald the professional video monitor (PVM) as the ultimate CRT TV experience. Formally used by broadcasters or medical professionals, most CRT PVMs (such as the Sony model below) can accept RGB video signals directly, which offers the best video quality for classic systems that support it.

Missing Systems

This book contains a wide variety of game consoles and gaming-focused computers, but it is not a complete collection of those systems. This second edition fills many of the major gaps, though there are still some unfortunate omissions. Most missing items are vintage computers or foreign-release consoles and computers, all of which can be very difficult or costly to acquire or borrow. The following consoles, handhelds, and vintage computers were worthy of inclusion in this book but weren't included due to access, brevity, or space limitations.

- Acorn Archimedes
- Amazon Luna
- Amstrad CPC
- Apple II
- Apple Macintosh
- Atari ST
- Bandai Super Vision 8000
- BBC Micro
- Commodore 128
- Commodore Amiga
- Design Master Denshi Mangajuku
- Enterprise computer
- Fujitsu FM-7, FM-77
- Gakken Compact Vision TV Boy
- Game King
- IBM PC Standard
- Mattel See 'n Say/Bandai Terebikko
- NEC PC-8001
- NEC PC-8801
- NEC PC-98
- Nichibutsu My Vision
- Oric computer
- Panasonic 3DO M2
- Philips Videopac G7400
- Picno
- Playdate
- Razer Forge TV
- Sega Pico
- Sharp MZ
- Sharp X1
- Sharp X68000
- Sinclair QL
- Sinclair ZX81
- Spectravideo
- Steam Machines
- Takara Video Challenger
- Tandy TRS-80
- Tandy TRS-80 Color Computer
- Texas Instruments TI-99/4A
- Video Buddy
- Video Challenger
- Video Driver

Accessories and Variants

Numerous console accessories and variants aren't featured in this book due to space limitations, redundancy, or formatting. The following pages collect and briefly highlight some of the most notable or relevant omissions.

Atari 400

The Atari 400 was an Atari 8-bit computer released alongside the Atari 800 in 1979. The Atari 400 served as an entry-level model that cut features to cut costs. Compared to the 800, the 400 had less memory, used a cheaper membrane keyboard, lacked a second cartridge slot, and only had RF video output.

Coleco Expansion Module #2

The ColecoVision's second expansion module was a steering wheel controller and gas peddle combo that plugged into the system's controller port. It came packaged with the racing game *Turbo* and worked with only five other cartridges.

Coleco Gemini

After the release of the Atari 2600 expansion module for the ColecoVision, Coleco released a stand-alone version that was dubbed the Gemini. This hardware clone played only Atari 2600 games and included a streamlined controller that had both a paddle and a joystick.

Sega Mark III

The Mark III was Sega's third iteration of the SG-1000, which featured improved graphics hardware and more RAM as well as a new slot for games on data cards. The console served as the basis for the Master System worldwide, and it was later rebranded as the Master System in its native Japan.

Nintendo Family BASIC Keyboard

The Family BASIC Keyboard was an accessory for the Nintendo Famicom that was released only in Japan. The keyboard add-on was designed to teach children typing and computer fundamentals. It offered BASIC programming, built-in games, a notepad, a calculator, and a music writing program.

Power Glove

The Power Glove was a unique controller for the NES released by Mattel in 1989. The glove paired with a sensor array placed around a television screen that triangulated the glove's position to calculate movement. The glove's movement and finger flexes were mapped to button inputs that controlled onscreen action.

NES Top Loader

The NES-101, more commonly known as the "Top Loader," was an updated NES released in 1993 for $49. The smaller and streamlined system featured a more robust game cartridge connector and rounded "dog bone" controllers. Video quality was worse, however, as the system had only RF audio/video output.

NEC Interface Unit

The NEC Interface Unit added CD-ROM capability to NEC's line of PC Engine and Core Grafx consoles and was released in 1988. It was composed of a dock that the console slotted into as well as a detachable CD drive that could also be used as a portable CD music player.

NEC SuperGrafx

The SuperGrafx was a short-lived variant of the NEC PC Engine console released in 1989 that contained more RAM and extra graphics hardware. Only six games were made that took advantage of the system's unique capabilities.

JVC X'EYE

The X'EYE was a Sega Genesis and Sega CD combined into a single console that was built by the Japanese electronics company JVC. Released as the Wondermega in Japan, these premium all-in-one units included a microphone input and could be used as karaoke machines.

Sega CDX

The CDX was a game console that combined a Genesis and Sega CD into a single small unit. While it required external power and a TV to play games, it could also function on its own as a portable CD music player.

Sega Nomad

The Nomad was a portable Sega Genesis that played games on its LCD screen or could output video to a TV. With no built-in battery, the Nomad required either direct AC power or a large, external battery pack to operate.

Super NES 101

The Super NES 101 was a cost-reduced version of the Super Nintendo released late in the system's life. The console's construction was simpler than the previous version, omitting features such as an internal RF modulator, a power-on light, and the unused bottom expansion port.

Neo Geo CDZ

The CDZ was a revision of the Neo Geo CD hardware and was the final home console released by SNK. The CDZ improved upon the previous Neo Geo CD with the addition of a double-speed CD drive, which meant faster loading times versus the original's single-speed drive.

Wii Mini

The Wii Mini was a low-cost model of the original Nintendo Wii that released in the US in 2013 for $99. It removed many features from the original Wii, including online capability, digital eShop titles, component video output, and GameCube backward compatibility.

Oculus Rift

The Rift was the first commercial virtual reality headset from Oculus, released in 2016 for $599. The headset required a PC, external sensors, and Oculus software to operate. The Rift was discontinued in 2019 and replaced by the Rift S, an updated headset with a higher-resolution display and built-in position tracking.

New Nintendo 2DS XL

The New Nintendo 2DS XL was the last model of the 3DS handheld lineup that was released in 2017 for $149. It retained the higher specs and C-Stick of the original New 3DS but omitted the ability to display stereoscopic 3D images.

PlayStation 4 Slim

The PlayStation 4 Slim was a smaller and more power-efficient version of the original PS4 that released in 2016 for $299. With a smaller SoC due to improved manufacturing, the PS4 Slim ran cooler and quieter than the original PlayStation 4.

PlayStation VR

The PlayStation VR was Sony's virtual reality headset for its PS4 platform. It required an external camera for tracking and either a DualShock 4 or the PS Move wands for interaction. It released in 2016 and sold for $399 as a stand-alone headset or for $499 as a bundle that included the camera and PS Move wands.

Xbox One Kinect

This second-generation Kinect was a short-lived peripheral originally bundled with every Xbox One. It was later sold separately to make the Xbox One the same price as the PlayStation 4. Microsoft then distanced itself from the Kinect, which was phased out and then discontinued. Less than 50 titles ever made use of it.

Xbox One X

The Xbox One X was a mid-gen refresh of the base Xbox One hardware that released in 2017 for $499. A premium console, the X featured an enhanced GPU rated at 6 teraflops and 12 GB of faster GDDR5 RAM. This boost in power improved performance and increased the display resolution in many older and newer titles.

About the Author

Evan Amos is a self-taught photographer who stumbled into becoming an archivist and game historian thanks to Wikipedia. Born and raised in Missouri, he currently lives in a Brooklyn apartment stuffed with gaming consoles and hardware.

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